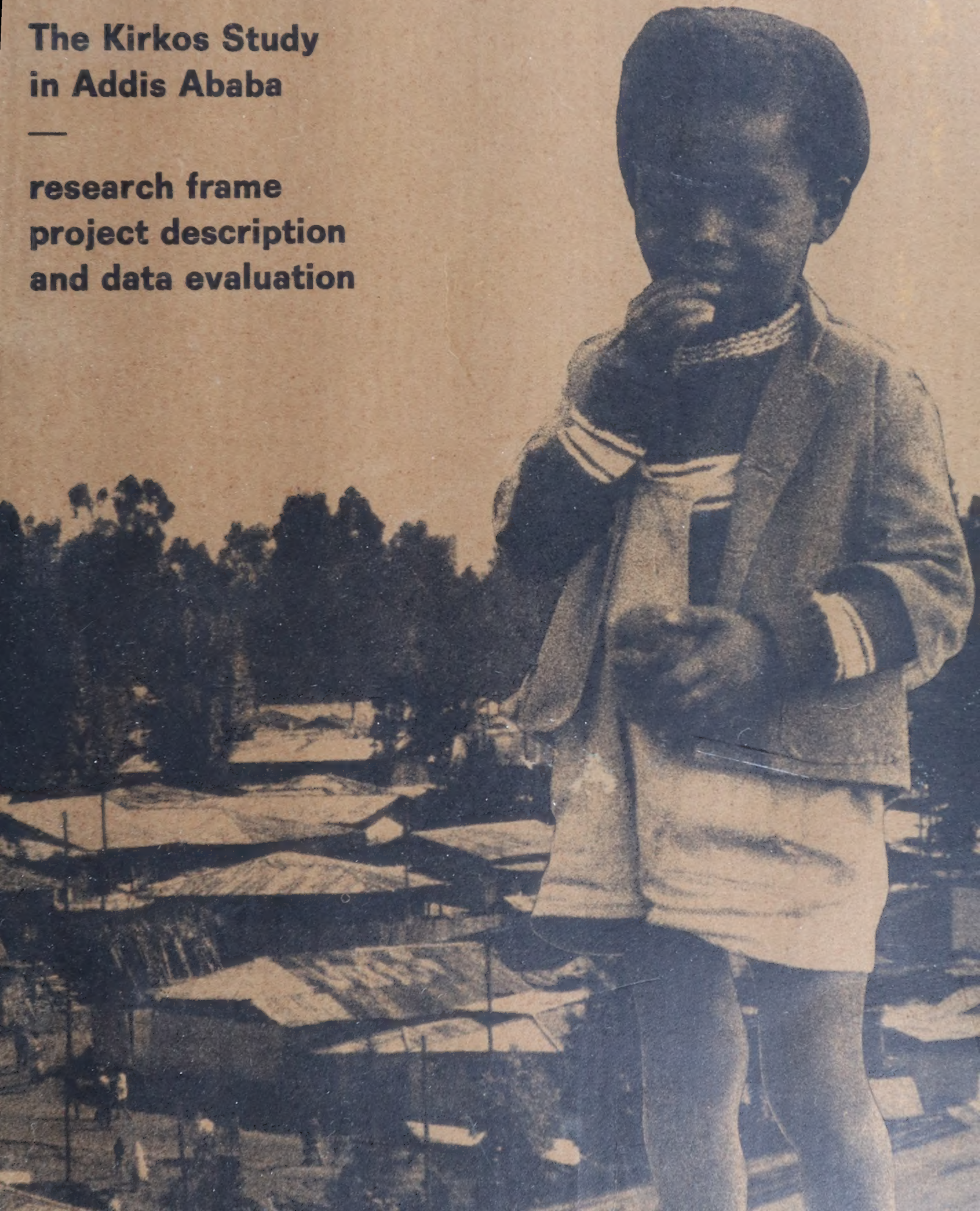
EXPLORING CHILD HEALTH AND ITS ECOLOGY

The Kirkos Study in Addis Ababa

—

research frame
project description
and data evaluation



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research frame project description and data evaluation

A report from a study jointly undertaken by

The Ethiopian Nutrition Institute

The Ethio-Swedish Paediatric Clinic
Department of Paediatrics
University of Addis Ababa

The School of Social Work
University of Addis Ababa

The Public Health Department
Municipality of Addis Ababa

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by

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KIRKOS SEFER

scale

100 metres


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AMROPA Garage
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Parliament
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MINISTRY of Interior
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SABA
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ETO
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JOMO KENYATTA AVENUE
Uraei
Ambesa Bus Depot
Police H.Q.
Chamber of Commerce
BAMBIS S.Market
Greek Club
URAEL
Juventus Italian Club
Greek SCHOOL
Min.of Mines
Min.of Communication
MOROCCO EMB.
Highway Station and Garage
RUWANDA
CAMEROON
Anti epidem
M.A.G.
Flat
Garage
MESHALEKIA
Market
Kirkos Church
LIBERIA EMB.
SCHOOL
KIRKOS
ORGANIZATION OF AFRICAN UNITY
Material Comp.
Coffee Mill
(POPULARE)
JAPAN EMB.
AFRICA AVENUE
RAS BIRU W. GEBRAEL STREET
BOLE
MALAYSIA
TRINIDAD & TOBAGO
SENEGAL EMB.
BURUNDI
EMBASSY of BULGARIA
TANZANIA EMB.
EMBASSY of ISRAEL

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INTRODUCTION

The point of departure of this project, which falls in the category of development research, is the immediate experience of caring for great numbers of malnourished and severely ill children in a developing country with inadequate economic and other resources. Basic in this research is also that kind of system of values that makes a medical worker respond to this felt need by trying to improve the quality of life not only for the individual patient but for all people in the community. It is in this situation that he will feel the need for increased knowledge about the health situation in the community and the complexity of factors that govern it, his aim being to have a basis for interference in an optimal way in order to improve health. This kind of research is normative and should be judged against the degree of accomplishment of this goal.

The medical workers involved in this project were attached to the Ethio-Swedish Paediatric Clinic (ESPC), the only hospital for children in Addis Ababa and the only paediatric university department in Ethiopia. Its 100 beds serving 2,500 in-patients per year, its large out-patients department with 100,000 yearly attendances and about 10 other health centres and Mother and Child Health Clinics (MCH clinics) were the only medical facilities available to a child population of approximately 400,000 in the city of Addis Ababa.

The daily experiencies at the ESPC indicated that child ill-health was a problem of overwhelming magnitude in this rapidly expanding African city. Great numbers of children were brought to the clinic with severe malnutrition and with serious infectious diseases, many beyond the reach of therapy. Because of limited resources the majority of these patients had to be treated on an out-patient basis. Only the most severely ill children could be admitted to the hospital, and in order to use the relatively expensive in-patients facilities effectively to the benefit of as many children as possible, preference had to be given to children suffering from curable conditions demanding short periods of treatment in the hospital. This moral dilemma of having to select some patients to be given the full resources of the hospital and refusing them to others had to be encountered daily.

The social histories of the patients indicated that child ill-health was associated with a background of unhygienic living conditions and poverty. Many mothers obviously did not have enough money to secure sufficient food for their families. Children successfully treated for malnutrition in the hospital often had to return to the same poor and unhealthy surroundings where they again became the victims of malnutrition and infection. The immediate feeling of usefulness in taking care of these children in the hospital thus often gave way to an after-taste of futility, especially as it was realized that they probably represented only the "top of an iceberg" of medical need in the community and that very little could be done to promote child health in general by giving treatment to a limited number of patients at a clinic.

The hospital experience indicated that there was a need to increase both curative and preventive child health services in the city. To what extent the selection of patients coming to the hospital reflected the need for child health care in the community was, however, not immediately obvious. A rational planning of child health programs with optimal use of limited resources would evidently have to be based on community information about the child health situation. It was also felt that, if the basic causes for child ill-health were to be found in the socio-economic and hygienic conditions in the environment, action to improve these conditions would have to be included in meaningful child health programs in addition to conventional curative and preventive services.

The lack of adequate hospital resources to care for great numbers of severely ill children suffering from preventable conditions thus raised the question of the role of health services in general. It was also realized that institutions like the ESPC - the only paediatric university department in a developing country - had a special obligation to analyse clinical and community health data in order to contribute to a realistic planning of child health services in the country as a whole.

The pattern of diseases among children attending the ESPC during the first years after its inauguration in 1959 were documented by Mannheimer (57). It

did not change significantly during the following years (89). The high rate of malnutrition and preventable infections as well the high mortality rate among in-patients (well above 20 %) made it obvious that the clinic had to engage in preventive programs outside the hospital. This led at an early stage to the formation of a mobile child health team, which visited the city´s slum areas. This was also used to obtain information on child health in the community. An anthropometric survey of children attending this mobile team revealed that growth failure, starting at an early age was exceedingly common in the child population of the community (88).

This was also evident from the surveys of child health in various parts of Ethiopia carried out by the Ethiopian Nutrition Institute (ENI). These studies (3,19,20,45) which included anthropometric as well as biochemical measures and clinical data, showed striking differences between rural and underprivileged urban children on one side and a small minority group of urban privileged children on the other side, the latter having a nutritional status very similar to that of European children. These surveys also demonstrated the coexistence of malnutrition and a high frequency of infections, as pointed out by Vahlquist (91), who also recognized the need to investigate these relationships and their background of unfavourable surroundings.

The associations between infant nutrition, morbidity and some social variables were illustrated by a study carried out in northern Ethiopia by Dodge and Demeke (16). Their results indicated that malnutrition developed already at the early age of 2 - 6 months and that it was significantly associated with low income. At this early age it did not seem to be related to morbidity rates. Parental education or the use of the village health centre could not be shown to have any impact on infant nutrition.

That the combination of conventional child health services and a supplementary feeding program had a positive influence on children´s nutrition, was suggested by the results of a rural field study undertaken by the ENI (46).

A community impact of the regular child health services have not been clearly demonstrated in the Ethiopian medical literature. Judging from clinical statistics they have not resulted in decreasing morbidity and mortality. Referring to the Ethiopian situation, Larsson and Larsson (56) point out that it will take many years before countrywide health services can be established and accessible to a majority of mothers and children and that intense efforts on different levels are necessary to break the "cycle of misery" of the Ethiopian child. How this should be best achieved with optimal use of extremely limited resources is, however, not obvious from the clinical documentation and from the community surveys referred to above.

The international medical literature of recent years gives evidence of an increasing awareness of the moral responsibility of providing health services to the large populations in the developing countries. To achieve this in countries with extremely limited health budgets, emphasis must be put on the development of basic, simple and inexpensive health services and on a redistribution of health resources from the often relatively privileged urban areas to the rural areas (21,39). Equal access to health services may, however, not always be achieved without profound changes in the political and economic system (66,78).

The serious deficiencies in the systems for health care in the developing countries are well documented by Bryant (6). He describes the impossible tasks that small health institutions have to face. A small health team consisting of one doctor, one nurse and some aids may e.g. be responsible for the curative and preventive health care of tens and even hundreds of thousands of people in a country which may have a health budget of one US $ per person and year. In this situation the pattern of medical care often adopted from Western medicine would be completely inadequate and new rules for the setting of priorities and a system of delegating medical work to nonprofessionals would be needed. This means that effective health care would depend not only on a fair distribution of resources but also on the education and use of health personnel, which would necessitate a reorientation of health policies

and medical education. Bryant also raises the issue of the integration of health services in the general development complex. This is a fundamental thought in a recent WHO publication (67) describing some community health projects from different parts of the world, which have been oriented towards the needs as perceived by the people themselves and based their success on active community participation.

The need to obtain "maximum return in human welfare from the limited money and skill available" (52) necessitates the development of realistic methods in the delivery of health care, as exemplified by a well-known manual for practical health care in developing countries, edited by King (52). This was also the basic philosophy of Morley (64) and Williams and Jeliffe (96) in their analysis of paediatric priorities and the organization of MCH care in developing countries. This kind of MCH services, designed to serve large populations have, however, rarely been evaluated in terms of community health benefit in relation to costs. This was pointed out at a recent seminar in Addis Ababa, discussing an optimum package programme for child health in Africa (68). It was also realized that measures to improve socio-environmental conditions such as sanitation, education and the provision of water, should be considered in the package for child health and that such measures would have to be evaluated in relation to ordinary clinical programs.

Similar conclusions were reached during the technical discussions at the World Health Assembly in 1974 (59), recognizing the importance for organizers of health services to consider all the environmental factors that influence health. An integrated multidisciplinary approach based on partnership between health and social services was called for. Limited resources make this kind of co-ordinated effort indispensable in the developing countries, requiring a radical change in roles and attitudes of health personnel with the emphasis on team work in preventive programs and on *nonmedical solutions to medical problems*. It was also pointed out that shortage of information is a central problem in this field. More basic demographic data, detailed information on socio-environmental conditions as well as accurate mortality and morbidity data would be

needed to investigate causes and effects, in particular the interplay of socia psychological, cultural, economic and biophysical factors as agents in the etiology of disease. This would be a basis needed for the assessment of health needs and priorities in the population and for the evaluation of the effectiveness of alternative forms of health care.To achieve this kind of research, reliable and valid indices as well as appropriate survey instruments would also have to be developed.

The necessity of viewing child health as an ecological phenomenon in a complex system of interrelated medical and socio-environmental factors, is a commonly held view in recent medical literature (14,41,70,75). Community based studies taking this multifactorial approach in the assessment of determinants for child health, are, however, very scarce and often lack in comprehensiveness.

Morley et al (65) compared sociological and medical characteristics in a group of underweight children with those of children with satisfactory weight gain and identified some factors associated with poor weight gain (low maternal weight, birth order over 7 years, death of a parent or broken marriage, previous history of measles, whooping cough or diarrhoea etc.). Kanawati and McLaren (50) compared Lebanese children of different nutritional development with regard to a more extensive list of socio-economic and medical variables. Such factors as introduction of supplementary foods, family income, mother´s education, the availability of a refrigator, household size etc. were ranked as some of the important factors when the two groups of children were compared. Wray and Aguirre (99) studied the relationships between nutritional status and various medical and socio-environmental factors in a cross-sectional study of Colombian children. Breast feeding, time for weaning, prevalence of diarrhoea and respiratory infection, maternal age and education, family income, food expenditure, etc. were found to be related to the nutritional status of children. Rea (73,74) studied groups of Nigerian children from different socio-economic classes and found that poor weight gain and high morbidity were associated to low social class. Cravioto et al (13) reported a detailed study of infants from a Guatemalan village in which weight gain of infants was found to be related to the frequency of infections but also

to large family size, old parental age, low income, a high proportion of income being devoted to food, low levels of education and strong attachement to traditional ways of life.

The studies mentioned above based their analysis on bivariate associations between expressions for child health and background variables by means of simple cross-tabulations. A multivariate approach was used by Christiansen et al. (11) in a study from Colombia, analysing the associations between nutrition and family social characteristics by means of multiple regression. Only mother´s age, family size, spacing of children and sanitary conditions were found to be related to weight and height independantly of socio-economic status, which emphasized the importance of within-class social differences affecting the growth of young children. An element of subjectivity was, however, introduced as several of the social variables had to be given numerical values according to factor scoring to make the multiple regression analysis possible.

The medical literature on child health in the developing countries has given much emphasis to the synergistic interactions between nutrition and infection (83). That community child health could be improved either by food supplementation or by curative and preventive health services were the basic hypotheses of a Guatemalan project carried out in the early 1960:s (81). The results suggested that improved diet had more influence on children´s health status than had the introduction of health services. Preliminary results from an Indian field study suggested that the combination of nutrition and medical services had a synergistic effect on child health (90).

Clinical statistics have often been the only source of information in reports discussing utilization and impact of health centres and MCH clinics in developing countries (18,53). Studies on health services utilization carried out in Tanzania, Zambia and Tunisia (54,86,4) were based on information from the community but limited the analysis to simple cross-tabulations and thus failed in accounting for the interplay of different background factors for utilization behaviour. This has been taken into account in studies from Taiwan and Chile as reported by Reinke (76,77).

The studies that have been briefly reviewed above, recognize the complex and multifactorial nature of child health as an ecological phenomenon but have scarcely considered this in the analytical phase of data processing. The bivariate associations studied contribute little to the generation of knowledge about determinants for child health in the complex eco-systems of a developing country, which they are, how they can be measured and how they interact. A comprehensive statistical analysis calls for multivariate approaches which allow simultaneous interpretations of the interaction patterns of the variables. Another basic prerequisite for this kind of evaluative research is that the components in the system to be studied can be defined and measured. In this respect already the basic concept of health presents difficult problems - regardless of whether the study is performed in a developing or a developed country. Morbidity, nutrition and other possible components in the concept of health must be identified and measured. The same is true about the factors in the socio-environment about which even less information is available. There would thus be a need for exploratory studies in the field of community child health which also aim at an investigation of methods for the collection and analysis of data.

This broad approach in the study of child health was implicit in the Kirkos study from the outset - even if its scope was considerably limited of various practical reasons. The basic assumption that factors determining child health are to be found in the socio-environment as well as in the health service sector led to the organization of data collection from several fields in which action to promote child health could be taken. A sociomedical-statistical research team from local institutions in Addis Ababa was formed and surveys of socio-economic and health conditions were organized in an area of the city at the same time as the performance and community utilization of a small MCH clinic was studied.

During the initial phase of data processing it became apparent that it was necessary to undertake a more thorough analysis of the premises and aims of the project. The implicit concepts and questions behind the study had to be explicitly stated, a strategy for the process of extracting relevant infor-

mation from the data had to be outlined and a logical sequence of steps in the analysis defined. The aim of this publication is to present this discussion and to serve as a basic reference on project preformance and baseline data for later articles covering more specific problems identified by the project.

CHAPTER 1

STRUCTURING THE PROCESS OF CHILD HEALTH RESEARCH

1. RESEARCH COMPONENTS

Facing a problem in applied research by necessity involves a choice of an appropriate research strategy. The research problem has to be clearly identified and expressed in concrete, operational terms to permit quantitative evaluation and a rational choice of study units in order to avoid ecological fallacies (79). The study group may consist of or represent a clearly defined population, depending on whether the survey is of a sample or a census type.

Having specified the research objectives and the unit of analysis, the survey has to be given a conceptual and technical design. There is initially a choice between a cross-sectional and a longitudinal design (or a combination). The one-point-time cross-sectional approach is less effective. It permits only restricted inference in the time dimension and produces weaker statistical precision. A longitudinal survey can be based on data collected at different points in time, for different persons representing a general but changing population (trend studies), for different persons representing the same specific population (cohort studies) or involve the collection of data over time from the same sample of respondants (panel studies). Longitudinal studies can further be subdivided into retrospective and prospective ones depending on whether we advance from the establishment of effects to the establishment of causes or from determinants to results.

The above specifications and choices will depend on the kind of inference we *want* or *can* draw from the survey. An exploratory "search device" may be called for when we deal with complex, unexplored interrelationships. The nature of the problem, on the other hand, may be simple enough to permit the confirmation of certain prestated hypotheses. In contrast, an exploratory study aims at generating hypotheses and will thereby contribute to the theory building in the actual research field as well as to the research methodology.

We recognize as illustrated in Figure 1 the above discussion as a pre-requisite for the structuring of every programme in the field of applied research.

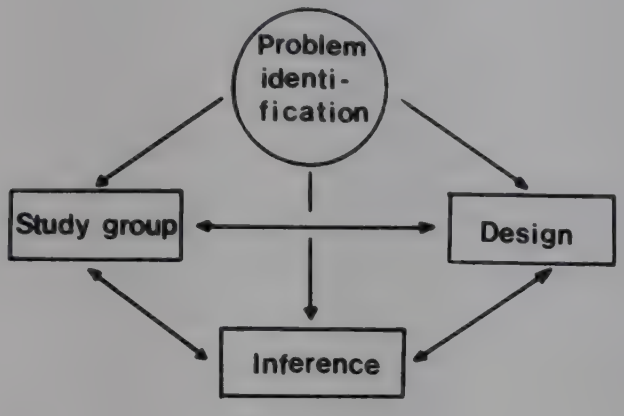

Figure 1. Four main components in applied research.

2. SCOPE OF THE PROJECT

2.1 Problem identification

The nature and extent of the problem areas that were in the focus of this study have already been indicated in the introduction. They can be summarized as follows:

- Community child health and its socio-economic and environmental determinants.
- Organization and economics of a minimum-package MCH clinic, its utilization by the community and some aspects of its impact.
- Exploration of socio-medical and statistical research methodology, to be applied on community health data in developing countries.

2.2 Study group

The problem areas as identified above called for sample survey procedures. In a situation where there is a lack of any kind of population registers, a problem encountered in this study, the statistical sampling frame has to be created in direct connection with the investigation itself, e.g. by numbering houses in an area judged to be "typical" of a greater universe of areas. In this study an air photo constituted the "frame" from which houses could be identified and

selected. The largest identifiable unit would often be the household. This motivates the use of cluster sampling techniques if individual (e.g. child) characteristics are also sought for. Since the respective household sizes were not known in advance, the sample size of children was, by necessity, a random variable. This sampling procedure induces correlations between children´s responses within the household, an intracluster correlation. If this is large and positive, meaning that children belonging to the same household behave or react alike, it is not a very efficient way of selecting a sample in terms of statistical precision. On the other hand, it is usually the only economically and administratively feasible device. This problem is further discussed and illustrated in a study of mothers´ and children´s utilization of the Kirkos MCH clinic (27,94).

2.3 Design

The multipurpose character of the project motivated the use of the cross-sectio as well as of the longitudinal designs. The cross-sectional approach was used i the base-line survey to form a basis for comparisons with later observations an in the follow-up measurements one year later to record mobility, mothers´ and children´s utilization of the clinic, birth rate and mortality. The longitudina approach was used in the measurement both of morbidity and weight of children i households selected for the purpose of obtaining information about the individu child´s load of acute and chronic illness.

2.4 Inference

During the planning of the community study it was realized that very little was known about what factors would be relevant expressions for socio-economic statu and environment - more was known about the methods of measuring nutrition and infection. There had to be an "ad hoc" approach in the selection of variables t be measured and the study would thus be characterized as *mainly exploratory*, in cluding as many seemingly relevant factors as possible in order to find out something at a later stage of data processing about their interrela tions and structure. The knowledge thus acquired will form a basis for the *generation of hypotheses* about the problem areas we set out to study.

Figure 1 indicates that the study group composition as well as the design have implications for what kind of inference can be drawn from a study. There are two main dimensions along which inference may be restricted, namely the geographical (cultural) and the time dimension. We do not claim that this project has any general applicability to all developing countries in the confirmatory sense. The hypotheses generated, however, may find empirical evidence not only in the country where this survey was performed.

3. A MODEL FOR THE RESEARCH PROCESS

The identified research components delineating the scope of this exploratory research constitute the framework within which the building of theories and the generation of knowledge take place. This may be seen as a process, the different steps of which also must be clearly defined, as they will determine the level of "inductive reasoning" (22,23,24).

> *Theories are nets cast to catch what we call "the world" to rationalize, to explain and to master it. We endeavour to make the mesh finer and finer (71)*

> *A theory is a model of some segment of the observable world...scientific models are holistic in that they put together both structure and function into closed systems whose characteristics are the consequence of the elements composing the system and the laws by which the elements interact among themselves (17)*

Our research may be seen as a process of increasing the refinement and precision of the researcher´s initial vague concepts in confrontation with reality. For the purpose of clarifying this type of inductive research in the field of child health we have attempted to identify the different stages of the process in the form of a diagram (Figure 2).

The starting point for the research is the experience, knowledge, values, aims and goals of the researchers. It should be pointed out that these entities operate throughout the process and that they are also influenced and may be changed in the sequence of events that will take place. The various components conceived to exist within the system to be studied are arranged into a pattern. This is the first step in the inductive reasoning, which we may call *a conceptual model* or a "pattern model of explanation" (51).

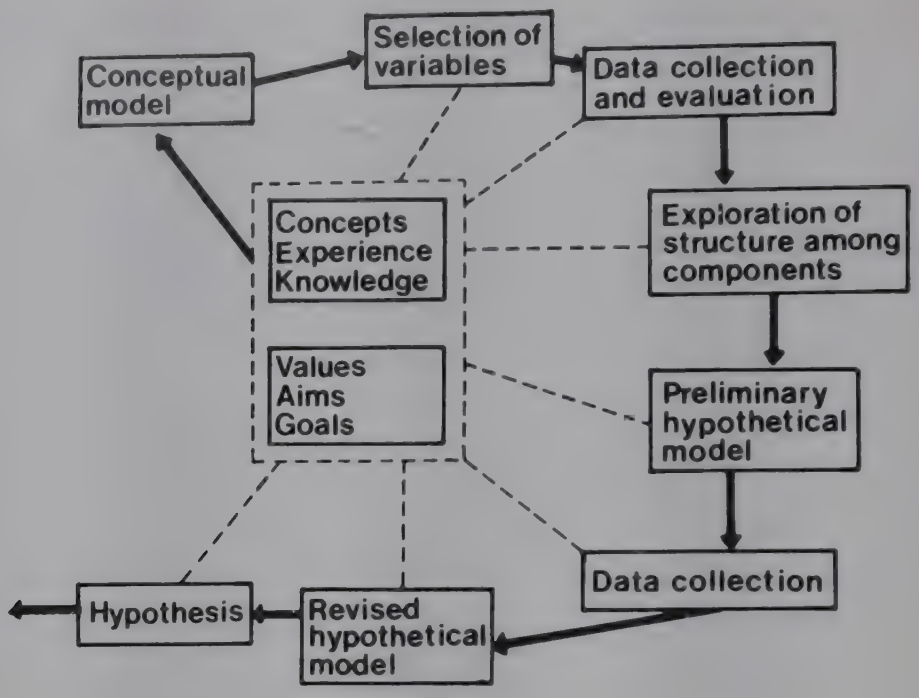

Figure 2. The exploratory research process.

These vaguely defined components in the system will then have to be represented by measureable entities, variables, as selected by the researcher according to previous knowledge and experience. Practical considerations may also determine the criteria for the choice of variables. Emphasis may for instance be put on operational criteria.

The initial stage of data processing involves collection as well as evaluation of data. Both the inductive character of the research and the data quality will have implications for the procedures of data analysis. The exploration of possible intercorrelations between the different variables may lead to the assumption of new components with new dimensions. Some variables may have to be chosen as the closest expression for a component that may not be immediately characterized in quantitative or classificatory terms. A relevant discussion of these issues is conducted in a paper by Morgan & Sonquist (60) who propose an approach to survey data which also takes into account important interaction effects.

> *... one legitimite objective of data analysis can be the generation or discovery of hypothesis, of propositions, of new conceptual frameworks. This requires the use of appropriate statistical procedures and corresponding logic and strategy (84).*

In the next stage a multivariate statistical method will have to be used to identify important relations between various components redefined according to what has been said above. This will lead to a preliminary hypothetical model, which again can be tested on a new set of data and result in a revised model from which certain hypotheses can be generated and tested in programs interfering with the system.

4. A CONCEPTUAL MODEL FOR CHILD HEALTH

It is very important to define clearly at the outset of a research the basic ideas and concepts as these often contain hypothetical elements, which later may have to be modified or rejected. This basic approach is very rarely encountered in medical field research and the medical literature does not provide guidelines that are generally agreed upon.

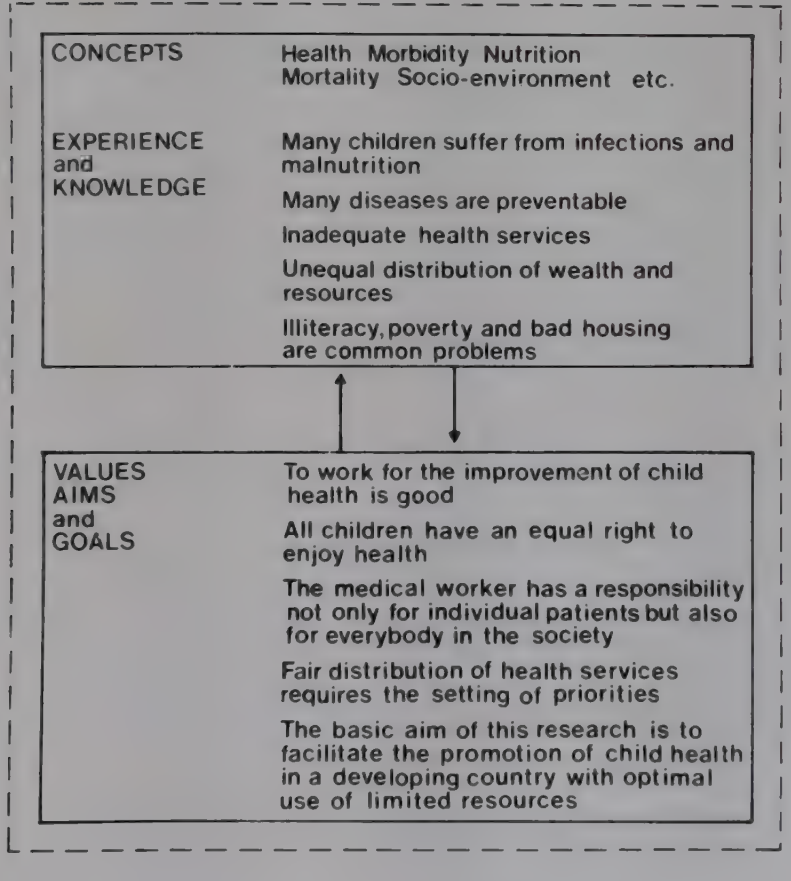

Figure 3. Some basic notions guiding the research.

Figure 3 summarizes the most important concepts in the field of child health, as well as aims and values among the researchers determining the direction of the research. The first step would then be to outline our basically hypothetical but naturally vague ideas about the pattern that can be formed by these concepts. This is then formalized into the conceptual model in Figure 4. We find it natural that the concept of health contains components such as morbidity, nutrition and mortality. We may also assume that child health is determined by factors in the socio-environment and in the health service sector. We also believe that there are important interrelations between nutrition and morbidity - a belief that is well founded both by our experience and in the literature (64,83).

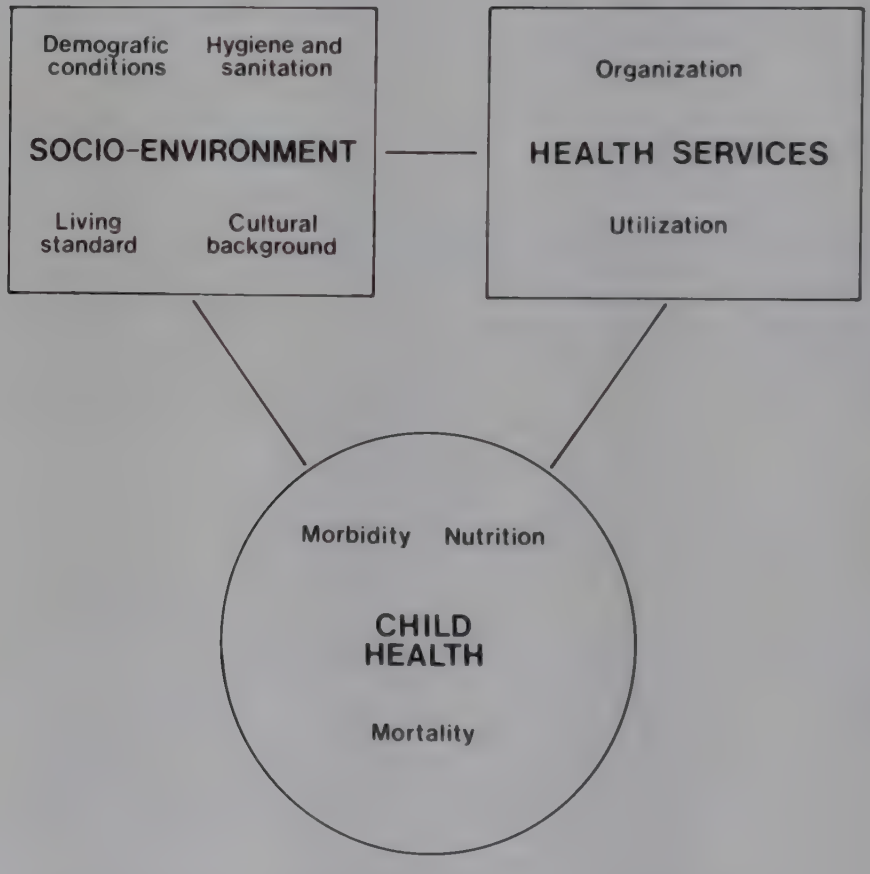

Figure 4. Conceptual model of child health.

The process then continues by listing possible factors within the different main components of the system with the purpose of selecting variables for the data collection. The choice of variables, naturally, is also influenced by the

experiences and knowledge of the researchers. One can, for example, identify a conflict or contradiction between two principles: The researcher may attempt to be as openminded as possible as he - at this stage - cannot know for certain which variables are important. On the other hand he has to be rational, his aim being to use the study to define priorities in health work in a certain society. Operational criteria will therefore probably be of importance already in the selection of variables. The data collection phase will add to his knowledge about the operational aspects of studying health.

The basic ideas brought forward in this chapter have also been presented in an abbreviated form in another publication (34).

CHAPTER 2

PROJECT DESCRIPTION

1. INTRODUCTION

This chapter describes the planning and data collection phases of the Kirkos Study, a joint undertaking by four Ethiopian institutions, the Ethiopian Nutrition Institute (ENI), the Ethio-Swedish Paediatric Clinic (ESPC), The School of Social Work (SSW) of the Addis Ababa University and the Municipality of Addis Ababa. The aim is also to identify some of the practical problems encountered in this kind of research, to provide an account of the methods used in the collection of community data and to describe the variables chosen in accordance with the frames given by the conceptual model in chapter 1.

2. PLANNING AND ORGANIZATION OF THE PROJECT

The first contacts between the institutions mentioned above took place in July and August 1971 and a research committee with representatives from each of them was formed in September the same year.This committee met approximately once a month during the preparatory phase of the project as well as after the baseline survey in February 1972 up till October 1973.

The bringing together of medical people, nutritionists, social scientists and health administrators to discuss the common problem of child health was a new, challenging and educating experience to all the participants. The initial discussions clearly demonstrated the value of viewing the problem of child health from different angles and convinced the participants of the possibility of undertaking an extensive study in this field by putting together the limited resources and facilities of the separate departments. Thus all four institutions gradually became involved in the preparation, financing and staffing of this project.

By permission of the municipal authorities a sub-district of Addis Ababa, judged to be reasonably representative of the city, was chosen as a sampling area for the community surveys and as a target area for the MCH-clinic.

The guidelines for the clinic were drawn by the participants from the ESPC and the ENI. A questionnaire for the community survey was produced by the joint effort of the committee members, representatives of the SSW dealing with the sociological part, those from the Municipality with the housing and sanitation part and those from the ESPC and ENI with the parts concerning medical information and nutrition.
The financial support for the project came mainly from the ENI and partially from the ESPC. The ENI thus covered most of the costs involved in the surveys, furnished the clinic and paid most of the salaries to its staff. The ESPC contributed a physician, who acted as the coordinator of the project and as supervisor of the clinic. Furthermore it supplied the necessary drugs and assigned its mobile vaccination team one day per week to the clinic. The ESPC also financed part of the follow-up survey in 1973. The SSW contributed by assigning its students as interviewers and field workers during the whole period of data collection 1971-1973. The Municipality provided the building used by the clinic and assigned the staff who carried out the mapping and numbering of houses in the sampling area.

The initial compilation of the very extensive data material was carried out by members of the research committee in 1972-1973. The further analysis, however, called for multivariate computor programmes that were not available in Ethiopia at that time. This was therefore organized in Sweden by some of expatriate members of the committee, who returned there after their assignments in Ethiopia by the end of 1973. These activities were mainly financed by some Swedish research grants. A close cooperation with the Ethiopian institutions was maintained partly by correspondence - especially as all original protocols were filed at the ENI and most of the coding work took place there - and partly by visits to Ethiopia for follow-up and complementary studies. These were carried out in 1974 and 1975 in cooperation with the ENI and financed by the grants mentioned above.

The local community leaders played an important role by accepting and supporting the project. The district governor and the leaders of the "Edder" groups (38,43) - economic associations of great importance in community life - were continuously kept informed about the project as a whole and especially about the clinic at repeated meetings. The "Edder" groups also cooperated by

accepting health education sessions at their meetings. The same readiness to be involved was shown by the local school teachers who were helpful in arranging similar teaching sessions for their pupils. In fact one of the lessons learnt during the course of this project was that successful community research in the field of health and health services does not only depend on the cooperation between several research disciplines - this cooperation must be extended to involve also the community people themselves.

3. SURVEY PROCEDURES

3.1 Background

Like most African cities, Addis Ababa was characterized by a heavy influx of people from the provinces in search of jobs,education and other facilities that the capital seemed to offer. The yearly growth rate of the population has been estimated at 7 %. The population of approximately 860,000 in 1971 would thus have increased to around 1 125,000 by 1975 (9). This has led to the development of slums lacking appropriate housing and sanitation facilities. The city covers a vast area but is not characterized by a strict geographical separation of rich and poor. Thus, in all its 10 districts well-to-do people and poor people live in close proximity.

One such area, Kirkos Sefer (=village). was chosen for the project on the basis of its accessability and because of its total lack of locally available modern health services for mothers and children. It was a densely populated area, surrounding a local market place in the Bole district of Addis Ababa. About half of the district´s population of around 100,000 was estimated to be concentrated in Kirkoș Sefer. Since it was known that the area had a high proportion of in-migrants from various provinces (9), it could be expected that different cultural patterns in terms of health practices and beliefs representative of the Ethiopian situation, would be prevalent in the area.

As no population register or detailed maps over the Kirkos area were available, an air photo was used as the sampling frame from which houses were selected. These could then be identified in reality and numbered. The resources of the project permitted a sample of 600 of the corresponding households to be

selected as the study group. Further analysis will be presented under the assumption that these households constitute a random sample from the Kirkos community, thereby warranting a measurable design (44).

The project was first introduced to the community during discussions with the mayor of the southern division of the Municipality of Addis Ababa and with the governor of the Bole district, to which the Kirkos area belonged. Later the "Edder" leaders were also informed during a meeting at the district governor´s office. It was pointed out that the project would mean the introduction of health services in the community and that a major reason for the surveys was to obtain information which could be used to direct these services to the actual need of the community. The same explanation was given directly to the public by the teams who numbered the houses in preparation for the surveys and later by the interviewers.

3.2 The baseline survey

Structured interviews were carried out during two weekends in February 1972 with representatives of 600 households by 52 students from the SSW who were specially employed and trained for this purpose. Six of the students were each made responsible for a section of the sampling area and 10-15 households were allotted to each interviewer. The interviews were conducted with the head of the household or the most senior household member present which, in most families, was the wife. During this survey baseline data were collected concerning socio-economic conditions, household composition, literacy, health beliefs and practices as well as some basic information on food consumption. During the following weeks the households were again approached for a survey of housing and sanitation by a team of 6 students, employed to continue the study on a long term basis. This time the team was supplemented by 14 student nurses who weighed all children under the age of 5 years. A third approach was made by the team to interview the mothers about practices in child health and child feeding.

3.3 The longitudinal study

In April 1972 a longitudinal study of households with young children was commenced and carried out for one year. Of the 600 households, 411 had

children under the age of 12 years and 346 had children under the age of 7 years. When the initial survey was completed,298 of these 346 households were still available and selected for the longitudinal study. This was based on fortnightly home visits,during which illnesses of the children,mainly based on information from the mothers,weight of children under the age of 5 years,births and deaths as well as mobility were recorded.The home visits were carried out by the six SSW students who, having no previous medical training, were expected to avoid active interference in medical and health matters. When asked for medical advice they could, however, refer to the small MCH clinic that was part of the project and situated within easy reach from the study area.

The choice of fortnightly intervals was based on rational as well as on statistical considerations. Weekly homevisits were thought to be too frequent to be accepted by the community. With the same resources twice as many households would be covered by homevisits if the longer fortnightly interval was chosen, thereby also increasing the expected number of discovered illness episodes with a duration of more than one week.

3.4 Special medical studies

During the months of May and June 1972 venous blood specimens were obtained in order to study serum protein levels, from 214 children that were followed in the longitudinal study (30).

In July 1973 throat cultures were obtained from 354 children during a survey of streptococcal carriers. The MCH clinic was also used to obtain material in a study of streptococcal skin infections (1) and the causes of diarrhoeal diseases (92).

From August to October stool specimens were collected from 528 children (36) constituting 80 % of the children in the households being followed by home visits. The specimens were examined for intestinal parasites at the ESPC laboratory. A similar collection of stool specimens was also included in the 1975 follow-up surveys with the aim of evaluating the effect of ascariasis on childhood nutrition (29). It may also be added that a small number of children were studied at the ENI in 1974 in order to discover possible effects on children´s nutrition of Ascaris treatment.

3.5 The MCH Clinic

The MCH clinic started at the same time as the baseline study after approval by the community leaders as described above. The clinic offered basic curative and preventive services to mothers and children in the community, including vaccinations. Health and nutrition education was given both during the daily clinical activities as well as during special sessions for patients at risk. The public was actively informed about the clinic only during the initial surveys in February 1972.

More detailed descriptions of the clinic have been published elsewhere (31) and will also be found in chapter 4.

3.6 Health education in the community

During the year after the baseline survey all school children in the community were given two lessons on child health and nutrition by the MCH clinic´s dresser. A similar program was extended to 6 local Edder groups at their regular weekly meetings. This program, successfully carried out by a SSW student, was designed as a preliminary study of the feasibility of involving Edder groups as change agents for child health in the community (43).

3.7 The follow-up survey 1973

One year after the initial survey the six students performed a follow-up study, aimed at all the initial 600 households. Mobility, changes in household composition, births and deaths as well as weights of children below the age of 5 years were recorded.

The Child Health Charts (31) used as the only record at the clinic and kept by the mother, made it possible to obtain objective information about the children´s visit rate to the clinic during the year as well as the number and type of vaccinations given to each child.

The mothers were also asked follow-up questions about their knowledge of vaccinations in order to measure changes related to contact with the clinic´s health education programmes. Of the 600 households, 161 had moved from the area and 22 households could not be identified. Of the households still present in the location, 58 were not examined due to absence or refusal.

Thus, follow-up information was obtained for 359 households.

3.8 Follow-up studies 1975

Follow-up data on utilization of the clinic were again collected from the Kirkos community in 1975, three years after its opening, to study the long-term utilization behaviour. Information was again based on inspection of the Child Health Charts. The households were selected from three geographically distinct areas within the community.

A supplementary study (95) of the frequency and duration of acute illness episodes was also carried out. This study was performed in the same way as described above by three new interviewers, apart from the fact that they visited the households daily during a period of only 2 months. The purpose was to evaluate procedures used in the one-year longitudinal study. The study group was composed of households that belonged to the 1972 sample and still remained in the area as well as some neighbouring households.

4 PRACTICAL PROBLEMS IDENTIFIED DURING THE SURVEYS

During the baseline study certain difficulties were encountered. Some of the respondants were somewhat suspicious, assuming that the interviewers were sent by the tax authorities. All households had, however, been informed before the survey that the research that was going to take place would be medically oriented and that a MCH clinic would be opened. This information seemed to have curbed most of the suspicions.

Another problem was the relatively high drop-out rate encountered during the longitudinal study. Of the original 298 households 35 moved out of the area during the study year and 22 households refused. Many refusals occurred after the collection of blood specimens, which gave rise to considerable opposition in most households. The staff taking the blood specimens and the home visitors were accused of collecting blood in order to "sell it to the blood bank". In many families illness among children was attributed to the fact that blood specimens had been taken previously. "Debteras" and "Wogeshas" (local practitioners), who had busy practices in the area and were opposed to modern medicine, grasped the opportunity to discredit the project. Thanks to the good personal contact the home visitors had already established with the

families, the drop-out rate due to refusals could be kept within reasonable limits.

The high mobility rate also limited the number of households available for the follow-up study. Some information about these households could, however, be obtained from neighbours.

Other problems were not identified until the compilation of the statistical material was commenced. The number of interviewers during the baseline survey was very high and this made supervision difficult and sometimes ineffective. Misinterpretations of certain questions and ommission of certain questions were relatively common. In view of this the orientation given to the interviewers (3 days) should have been extended over a longer period. A pilot study was performed - one interview per interviewer - after which some mistakes were discovered. This should probably have been followed by a second pilot study to ensure that the corrections were followed. Some of the uncertainties will be pointed out in the section describing the variables.

Other problems or difficulties could, afterwards, be attributed to mistakes by the research committee in formulating the questions. Some information obtained, thus dealt only with the individual respondant rather than the household as a whole. This necessitated complementary questioning, e.g. about religion and ethnic group, during the subsequent follow-up study.

5. CHOICE AND DESCRIPTION OF VARIABLES

In chapter 1 we have summarized the most important concepts in the field of child health into a conceptual model (Figure 4). We have now reached the stage when possible factors within the different main components of the system will be considered, with the purpose of selecting variables for the collection of data.

During the preparation of the questionnaire for use in the baseline survey, it was realized that very little was known about which variables would be relevant expressions of socio-economic level, environmental conditions etc., in the local setting. Therefore, in this exploratory study as many seemingly relevant factors as possible had to be investigated in order to find out some-

thing at a later stage about their structures and interrelations. The following is an account of the variables used.

(1) AGE of the household members was based on information from the respondants during the initial survey. If uncertain about the age, the respondant was made to relate the birth of the children to an important event during the year or to a religious festival in the Ethiopian calender. New enquiries about the age of the household members were again made during the follow-up study in order to test the reliability of the information given. This will be discussed in chapter 5.

(2) WEIGHT. Children under the age of 5 years were weighed, if less than 10 kg with portable baby-scales and if over 10 kg with an ordinary bathroom scale, carefully calibrated before usage. Weight was recorded to the nearest 0.1 kg. Weight for age was expressed as a percentage of the Harvard Standard (48) which also allowed a classification of the children into different nutritional groups (49).

(3) WEIGHT CHANGE during one year's observation time was measured for children under 5 years and expressed as a percentage of expected weight gain within each age group. The weight variables will be discussed in greater detail elsewhere (32).

(4) HOUSEHOLD COMPOSITION. Each household was classified according to the tota number of household members, number of children under 12 years and number of children under the age of 5 years.

(5) HOUSEHOLD INCOME. Information on income was first obtained during the initial survey. The accuracy of the information presented certain problems as some people were reluctant to state their income. The intimate knowledge of the area and its people acquired by the home visitors during one year and their familiarity with various professions and their corresponding income was used to check the initial information and made it possible to classify the households into five income groups: < 50, 50 - 99, 100 - 299, 300 - 499, and 500 or more Eth. $ per month. It had been claimed that

an income of less than 100 $/month did not allow for the purchase of an adequate amount of food in an average family (40). The starting salary of a university graduate was 500 $/month.(1 Eth.$ = 0.50 US $)

(6) HOUSING TENURE AND COST. Households that paid rent were divided into the following groups: House rent < 10, 10 - 29, 30 - 49, 50 - 69, 70 - 89, and 90 Eth. $ or more per month. Households who owned their house and/or land, were put in a special group. It was not possible to arrange for the estimation of the costs of housing in these households, but they would probably be placed in the higher cost groups.

(7) NUMBER OF ROOMS. The households were classified into the following groups: 1, 2 and more than 2 rooms.

(8) LIVING AREA PER HOUSEHOLD MEMBER. During the follow-up study the total floor space was roughly measured by the interviewers and expressed in m^2/person. The following class limits were used in the classification: 2.5, 5.0, 7.5, 10.0, 15.0, 20.0, 25.0 and 30 m^2/person.

(9) LATRINE STANDARD. The following classification was adopted in order of decreasing hygienic standard:

a) water flush toilet
b) private pit latrine
c) pit latrine shared with other households
d) use of public latrine or "the open field" for defecation

"Public latrine" refers to a pit latrine, owned by the nearby railway station. This latrine was extremely dirty and unkempt.

(10) WATER AVAILABILITY. All the households had access to tap water. But the following classification was considered to reflect varying degrees of availability:

a) private tap in the house
b) tap shared with other households in the compound
c) water bought from neighbours

d) water fetched free of charge from a standpipe owned by the railway station but situated some distance from the area.

(11) WATER CONSUMPTION. The households were interviewed about the monthly cost of water (Municipality charges were 50 cents per m^3) or - if they got it free from the tap owned by the railway station - how many "Baldis". a local container measuring about 15 litres, they used per day. In this way it was possible to estimate the daily water consumption in litres per household. The households were then classified according to daily water consumption per household member with the following class limits: 2.5, 5.0, 7.5, 10.0, 15, 20, 30, 40, 50 litres/person/day.

(12) EDUCATION: Based on information obtained during the initial survey the heads of households and the mothers in families with children could be classified into three educational groups:

a) complete illiteracy (not able to read or write)
b) literacy or partial literacy but no formal schooling
c) literacy and one to several years spent in a government or private school or higher education

(13) RELIGION. Heads of households and mothers were classified as:

a) orthodox Ethiopian Christian
b) muslem or
c) other religion (mainly other Christian denominations).

(14) ETHNICITY. The classification was based on information from the households about the ethnic identity of the members and checked against the place of birth of the respondant and the intimate knowledge about ethnic grouping among the interviewers and the home visitors (Tigrigna speaking people from Eritrea were grouped as Tigres). The main ethnic groups formed separate classes: Amhara, Tigre, Oromo, and Gurage. The minority ethnic groups were combined into a fifth class.

(15) KNOWLEDGE ABOUT VACCINATIONS. The respondants were asked if they knew any means of preventing a child from getting the following, locally well known

diseases: tuberculosis, smallpox, whooping cough and tetanus. If the answer was yes, they were asked how this could be achieved. If they volunteered the answer "by vaccination" they were classified as "knowers", otherwise as "non-knowers".

(16) BELIEFS AND PRACTICES CONCERNING MEASLES. Measles is an example of a common and important childhood infection. The practices of the mother in the treatment of children with measles are regulated by strong local beliefs about its supernatural cause, but may also be influenced by modern concepts. It was possible to classify the mothers into 3 groups according to their opinion about the cause of measles:

a) traditional
b) mixed traditional and modern concepts
c) modern concepts.

It was also possible to use similar categories in the classification of the mothers according to their attitudes about the treatment of children with measles. A detailed report about measles will be presented in a later publication (26).

(17) CIRCUMCISION, CLITORIDECTOMY, UVULECTOMY AND TOOTH EXTRACTION. According to traditional customs prevailing all over Ethiopia, boys should be circumcised and girls undergo clitoridectomy. Another such practice is extraction of the first milk teeth that appear in the infant. The traditional belief that the uvula may suddenly swell and suffocate small children explains the dangerous practice of cutting the uvula - often in connection with acute throat infections. These operations are usually performed by local medical men (wogeshas) without any form of hygienic precautions. The respondants willingly volunteered information if the children had undergone these operations or not.

(18) HAS THE CHILD HAD ANY VACCINATIONS? This question was answered for every child by yes or no.

(19) UTILIZATION OF THE CLINIC. At the follow-up study the mothers were asked if they had used the MCH clinic for any of their children. Information

about individual children's visits to the clinic and the number of vaccinations given were obtained by inspection of the Child Health Charts. The results are discussed elsewhere (27,94).

(20) MORBIDITY. During the fortnightly home visits the mother reported on the present health of the children. Each child was then registered as being ill or not ill. The sick children's symptoms were recorded on a special checklist with the commonest symptoms and signs: fever, diarrhoea, vomiting, cough, sore throat, eye infection, ear discharge, skin infection, rash etc. The symptoms and signs of measles - a well known entity by Ethiopian mothers were also recorded on a separate list in greater detail. Total morbidity was measured as the proportion of home visit days during which the child was reported to suffer from an acute illness. Based on the check-list with symptoms and signs, two main subgroups of illness could be distinguished; respiratory infection and gastro-enteritis. Separate morbidity rates for these entities were calculated. Statistical problems related to the measurement of morbidity are discussed eslewhere (35,95).

(21) INCIDENCE OF INTESTINAL PARASITES. The children studied for intestinal parasites were classified according to the number of species of intestinal parasites that they harboured as well as to the presence of specific parasites in their stool. A detailed presentation of intestinal parasitosis will be given in another publication (36).

In Figure 5 the variables, 1-21, are summarized and arranged within the frame given by the conceptual model developed in chapter 1. The next undertaking will be to further arrange and evaluate the components at each level of the model. Furthermore operational criteria must be put on the variables representing the components to be able to define "at risk" or "target" groups in practical health work.

In the later stages of formulating hypotheses, the various components may be grouped according to different levels of influencability and action

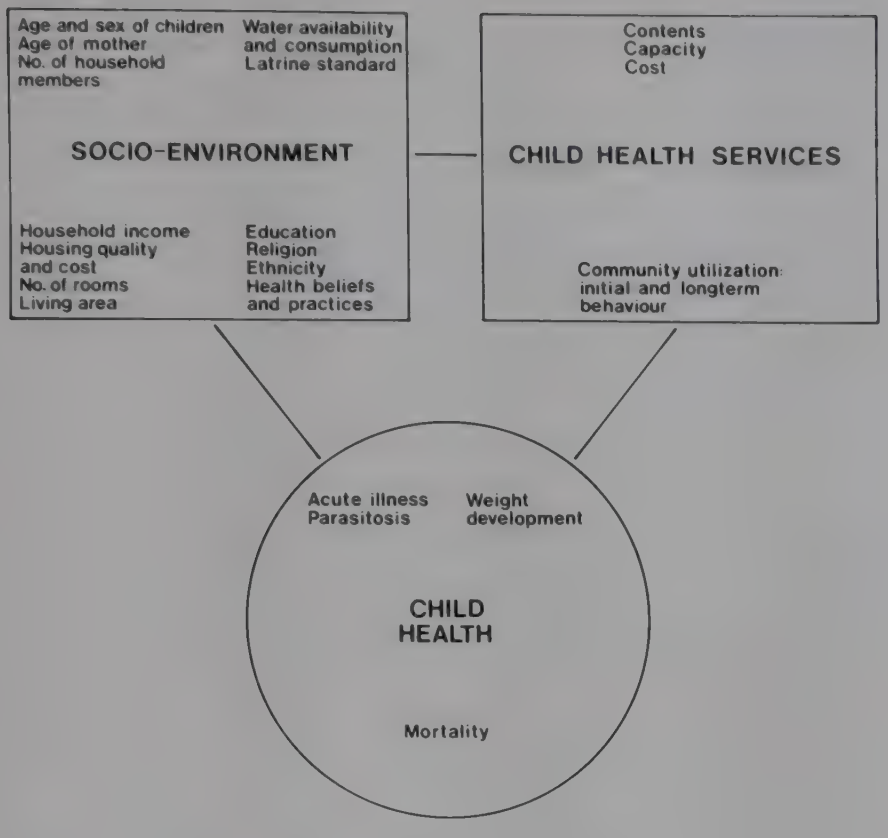

Figure 5. Variables in the conceptual model of child health as adopted in the Kirkos study.

orientation - medically, socially or politically - as the ultimate aim is to identify ways to interfere in these fields towards the improvement of child health.

CHAPTER 3

BASELINE DATA FROM THE KIRKOS COMMUNITY

1. INTRODUCTORY REMARKS

The Kirkos "Sefer" (see map) was, as previously mentioned, a concentration of houses within the Bole district of Addis Ababa with a population that could be estimated at around 40,000-50,000. It surrounded a local market place, overlooked by the Kirkos Church, from which the area derives its name. It was, generally speaking, a residential area mainly for the low income group. There were a few small shops and local drinking houses, "Talla" and "Tej Bets". There was a recently constructed Police Station and a number of small, privately run schools of low physical standard. The nearest government school was situated approximately 1 km from the area. At the time of the baseline study there were no medical facilities in the area, the nearest clinic being 3 km away and the nearest hospital 5 km away.

The area was accessible by an asphalted road that passed through the middle of the area. The roads in the area were generally not passable by car. Only 13 % of the households in the sample were located near the main road, 33 % were accessible by 4-wheel-drive vehicles and 54 % only by foot.

This chapter describes the sample of households in terms of housing, sanitation, water supply and also aims at a brief medical and demographic characterization. Whenever possible, a comparison is made with what is previously known about conditions in Addis Ababa. Most figures and some of the tables with percentage distributions are also documented by more detailed tables in the Appendix.

2. HOUSING

In terms of housing the Kirkos Sefer displayed a variety of standards. The majority of the houses, however, were built in the traditional way and made up of wood and clay (chika). Most of the households in the sample lived in compounds with one house divided into several housing units for the separate households, which shared water and latrine facilities.

The 1967 Addis Ababa Housing and Population Census (7) divided the separate housing units into 3 types:

a) Permanent (made of durable material and expected to maintain their stability for a long time.Chika and/or wood houses with thatched or corrugated iron roofing, good foundation and proper floor are also permanent).

b) Semi-permanent (made of non-durable material and not expected to maintain their stability so long. A chika house with a thatched or corrugated iron roof, no proper ceilings and/or floor and poor foundations is in this group.

c) Improvised (shelters or structures made mostly of waste materials and usually without a predetermined plan).

If establishments (shops, factories etc.) are excluded, 48.9 % of the housing units in Addis Ababa could thus be described as permanent, 49.9 % as semi-permanent and 1.2 % as improvised. The corresponding figures in the Kirkos study could be estimated as 63.7 , 35.0 and 1.3 % respectively. A comparison should, however, be made with caution as the sampling unit in the Municipality study was the housing unit and in our study the household.

Table 1. NUMBER OF ROOMS PER HOUSEHOLD AND NUMBER OF HOUSEHOLD MEMBERS PER ROOM: Percentage distribution in 563 households.

No. of rooms per household	% of households	Average no. of persons per room
1	33.4	3.4
2	43.5	2.4
3 or more	23.1	2.4 or less
Total	100.0	

People in the Kirkos area lived in crowded conditions. Thus 77 % of the households occupied only 2 rooms or less (Table 1). Another measure of crowding would be the approximate information about living area per household member (Figure 6).

In Addis Ababa, at the time of the survey, land and houses were generally owned privately. Moreover,5 % of the population owned 95 % of the private land (97). These landlords had sold plots of their land from time to time to individuals who had built houses for private use and for rent.

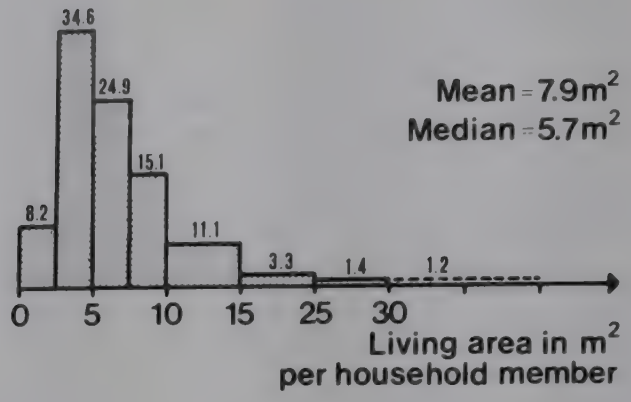

Figure 6. LIVING AREA. Percentage distribution in 485 households.

In the Kirkos area 70 % of the households rented their homes (Figure 7). This figure can be compared, with some reservation, as mentioned above, with Addis Ababa as a whole (7) where the percentage of rented housing units was 57 %.

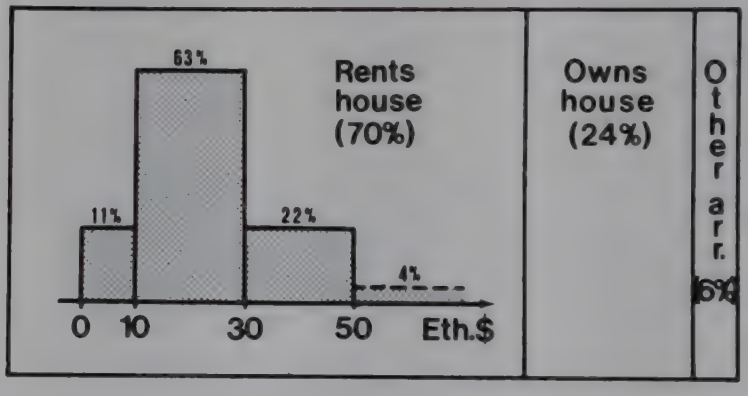

Figure 7. HOUSE TENURE AND MONTHLY HOUSE-RENT. Percentage distribution in 595 households.

3. SANITATION

The sanitary conditions in Kirkos Sefer were of the same low standard commonly found in Addis Ababa at large. The Municipality provided trucks that collected refuse but this service was used regularly only by 39 % of the households; 28 % dumped their refuse outside the house or in small streams running through the area; 29 % used the collection service irregularly, which probably means that they dumped the refuse on the street where it was picked up on and off by the Municipality trucks. Dirty water

was also often disposed of on the streets, where sewage ditches could often be seen and where people sometimes had to jump between stones in order not to dirty themselves. Water pipes often passed in close proximity of the sewage ditches. Children were usually seen playing in the dirty streets.

Table 2. LATRINE STANDARD. Percentage distribution in 577 households.

Type of latrine	% of households
Water flush toilet	4.9
Private pit latrine	11.3
Shared pit latrine	73.3
Public pit latrine	9.6
Open field	0.9
Total	100.0

More than 90 % of the households used pit latrines (Table 2). The majority of these were shared between several households living in the same compound. About 10 % of the households were without latrine but could use a public pit latrine made available by the nearby railway station. This latrine was uncovered and extremely dirty. The general experience of the home visitors was that most of private and shared pit latrines were unkempt and dirty, 50 % of them lacking cover. In fact 68 % of the latrines were each supposed to serve on an average, more than 10 persons.

Table 3. TYPE OF LATRINE BY NO. OF PERSONS USING IT. Percentage distribution in 531 households.

No. of persons served by latrine	Households with/or using			
	Water flush toilet	Private pit latrine	Shared pit latrine	Public latrine or open field
1 - 4	7.2	26.5	4.8	-
5 - 9	57.1	46.9	19.4	-
10 -	35.7	26.6	75.8	100.0
Total	100.0	100.0	100.0	100.0

The traditional rural habit of defecating in the open field was also prevalent in Addis Ababa. However, only 1 % of the respondants admitted this practice. The experience of the home visitors was, however, that the latrines

attached to the households were not regularly used, especially not by the children who used to relieve themselves in the compound or outside the house, often in the street.

The figures illustrating the latrine standard in the Kirkos area can be compared with some information available for Addis Ababa at large (10). According to this source 8 % of the households had water flush toilets and 25 % were without toilet facilities.

4. WATER SUPPLY AND CONSUMPTION

By Ethiopian standards Addis Ababa was relatively privileged with regard to the supply of piped water. According to available sources (10) 93 % of the households had access to piped water in the capital, whereas less than half of the households in smaller towns had this facility, which was practically non-existant in rural areas.

Our survey showed that practically all households had access to piped water. Only one of the 600 households took its water from a well (Table 4). The majority of the households shared water taps with other households living in the same compound. Those who did not have water taps in their homes or in the compounds either bought their water from neighbours or fetched it free of charge from a standpipe owned by the nearby railway station.

Piped water, however, does not necessarily mean good quality water. The proximity of pit latrines and sewage ditches to the water pipes may have caused contamination with faecal matter and favoured the spread of intestinal infections.

Table 4. SOURCE OF WATER. Percentage distribution in 578 households.

Source of water	% of households
Private tap	10.7
Shared tap	59.0
Buying from neighbours	6.6
Community standpipe	23.5
Well	0.2
Total	100.0

The Municipality's charge for water was 0.50 Eth. $ per m^3 which may have been a limiting factor for the consumption. The effort it took to fetch free water from the community standpipe may, of course, also have limited the use of water. Approximate calculations of water consumption in litres per capita and day showed a wide variation, 1.7 - 120 litres/capita/day. The median household consumption was 11.4 litres/capita/day (Figure 8).

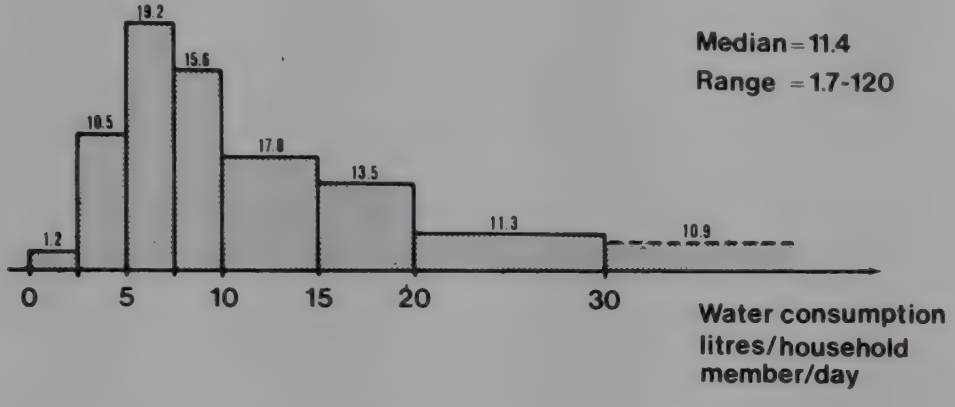

Figure 8. WATER CONSUMPTION. Percentage distribution in 495 households.

This level of consumption corresponds to the lowest levels found in a review of water consumption in developing countries, according to a WHO publication (15), which also gives the basic water requirement for physiological needs as approximately 2 litres/capita/day. Designs for water supply systems in urban areas in developing countries usually use values of 40 litres/capita/day, with provision for waste, if the water is taken from public hydrants. This may be compared with an average domestic water consumption in American cities of 180 litres/capita/day (15).

The low levels of water consumption found in our survey obviously mean that the majority of the households used very little water for the purpose of personal hygiene and washing.

5. DEMOGRAPHIC AND SOCIO-ECONOMIC DESCRIPTION

The total number of individuals contained in the sampled households amounted to 2,926. Their age distribution (Figure 9) corresponds well to the usual pattern

in developing countries and to what is previously known from Ethiopian surveys (8). Thus 42.7 % were under 15 years and 50.4 % were within the economically active group (defined as 15-59 years).

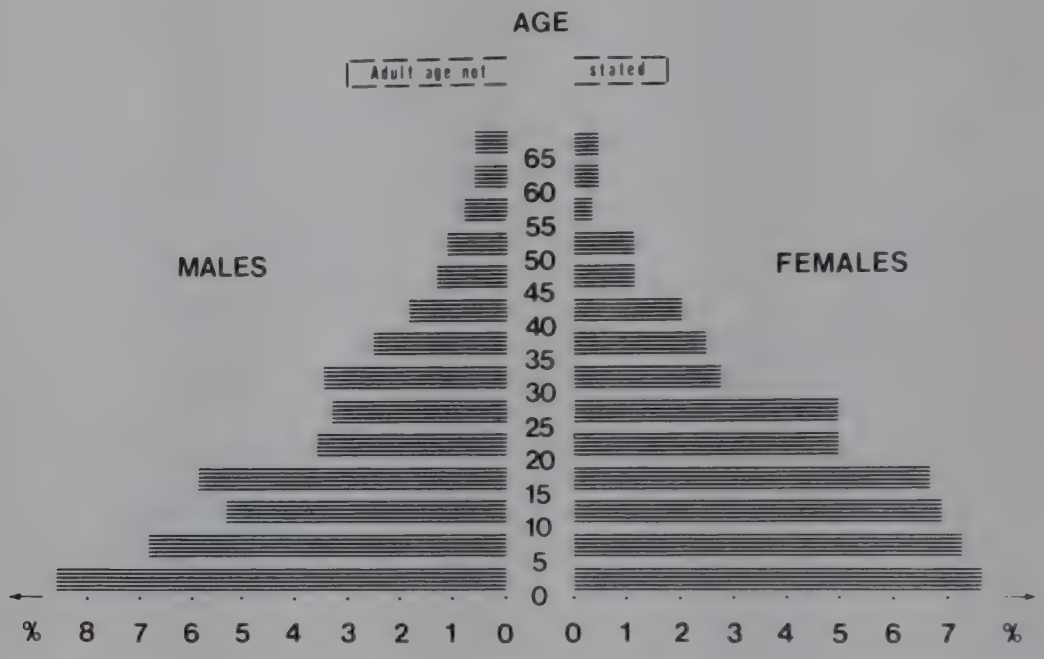

Figure 9. A POPULATION PYRAMID based on the age distribution in the sample of 600 households in the Kirkos Area.

The average age of males was 21.8 and of females 20.8 years, somewhat lower than in Addis Ababa as a whole (9). Low male/female ratios were found in the age groups 5-29 years as in the above mentioned survey (Figure 10). This may be interpreted as the effect of a high in-migration of young women from the provinces (9).

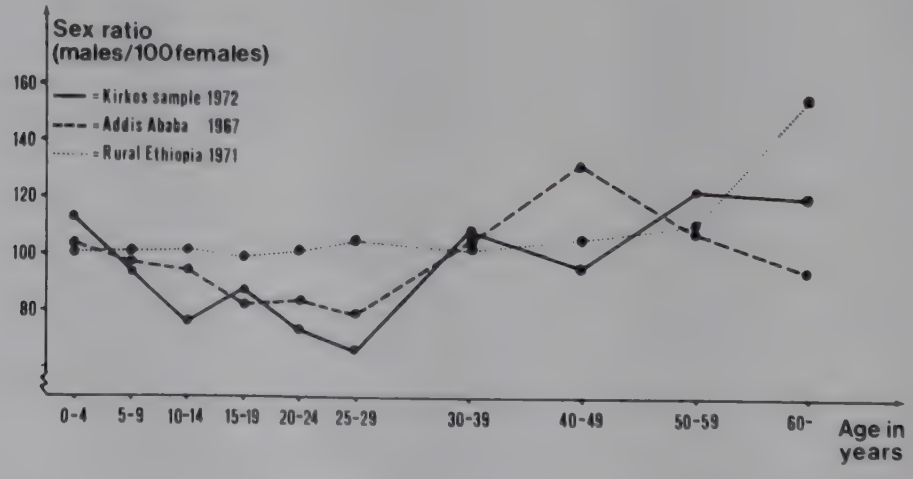

Figure 10. AGE DISTRIBUTION OF SEX RATIO in the Kirkos sample as compared to Addis Ababa 1967 and rural Ethiopia 1971.

The age distribution of 1,020 children below the age of 12 years (in 411 of the 600 households) constituting our study group of children, is given in Figure 11.

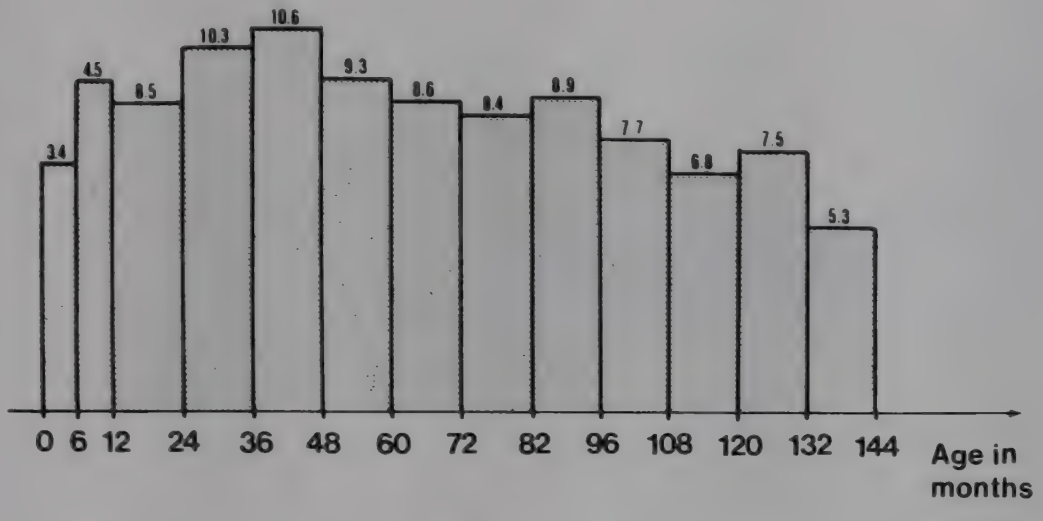

Figure 11. AGE DISTRIBUTION, in percentages, of 1,020 children in 411 households.

The mean and median household size was 4.9 persons, and the average number of children under the age of 12 years per household was 1.7 or 2.5 in the households that had at least one child in this age group (Figure 12).

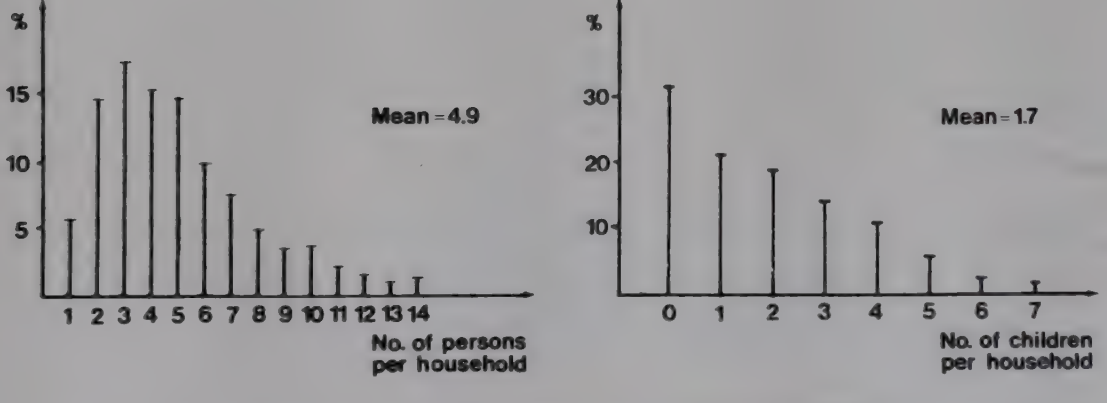

Figure 12. HOUSEHOLDS SIZE AND NO. OF CHILDREN. Percentage distribution in 600 households.

Household income was one measure of socio-economic standard. Over 50% of the households had a monthly income of less than Eth. $ 100. Household income should preferably have been expressed in Eth.$ per capita. This was

however, not possible because of the inexact information about household income.

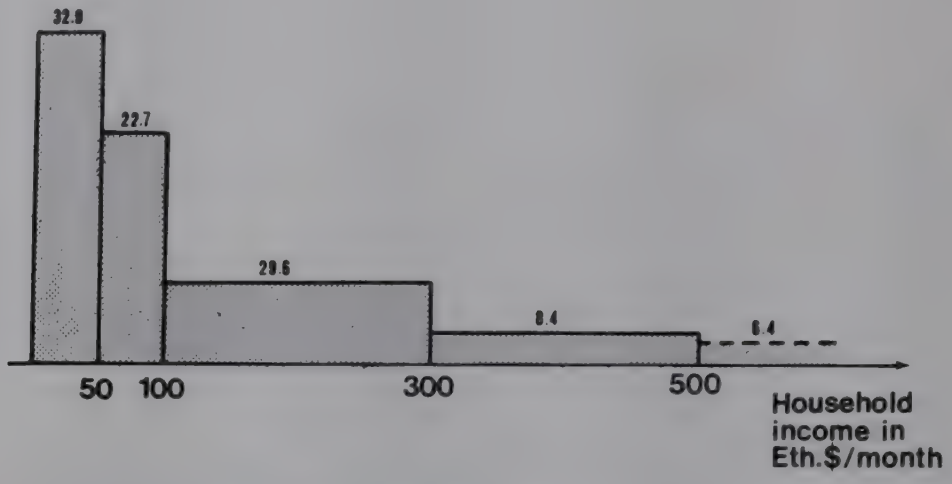

Figure 13. HOUSEHOLD INCOME. Percentage distribution in 550 households.

Classification according to social status in terms of profession was not attempted, due to lack of rules for this kind of stratification. A variety of professions were represented among the adult household members - from a few skilled academic and technical professionals to small shopkeepers and daily labourers and guards, often unemployed. Prostitution was prevalent as a source of income for some single women. Other women, without a husband, had to support a family on the very meagre income (often less than Eth. $ 10/ month) obtained by selling local beer (talla) or by baking bread (injera) in other people´s homes. In fact a large proportion of the households were headed by single, widowed or divorced women.

In the study area 85.8 % of the heads of households were Orthodox Christian and 8.3 % Moslem. The general figures for Addis Ababa (9) were 85.7 and 10.7 respectively (Figure 14).

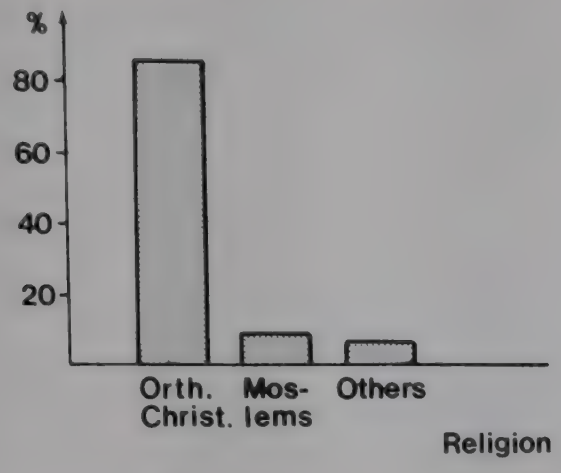

Figure 14. RELIGIOUS AFFILIATION. Percentage distribution in 599 households.

All the major ethnic groups living in Addis Ababa were also represented in Kirkos Sefer (Figure 15). The population survey of 1967 (9) gives the Amharic speaking population of Addis Ababa as around 75 %. Tigrigna, Guragigna and Galligna were each spoken by 5-7 % of the population. The latter figures were obtained by asking which language was used at home, which probably meant a certain bias in favour of Amharic, being the official language. It is, however obvious that the Kirkos Sefer had some overrepresentation of people originating from the provinces of Tigre and Eritrea.

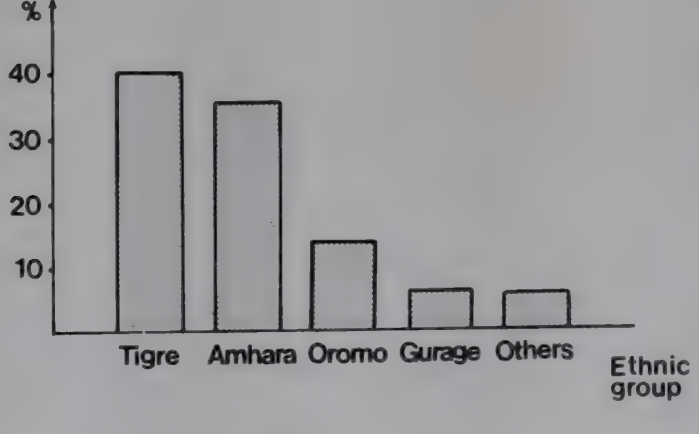

Figure 15. ETHNICITY. Percentage distribution in 544 households.

The literacy rate in Kirkos Sefer was 70.2 % among male heads of households, 24.4 among wives and 12.6 % among female heads of households. This discrepancy in educational status between adult males and females is also evident from the results of the 1967 Addis Ababa population survey (9) which found

a literacy rate of 60.5 % among males and 25.8 % among females above the age of 10 years.

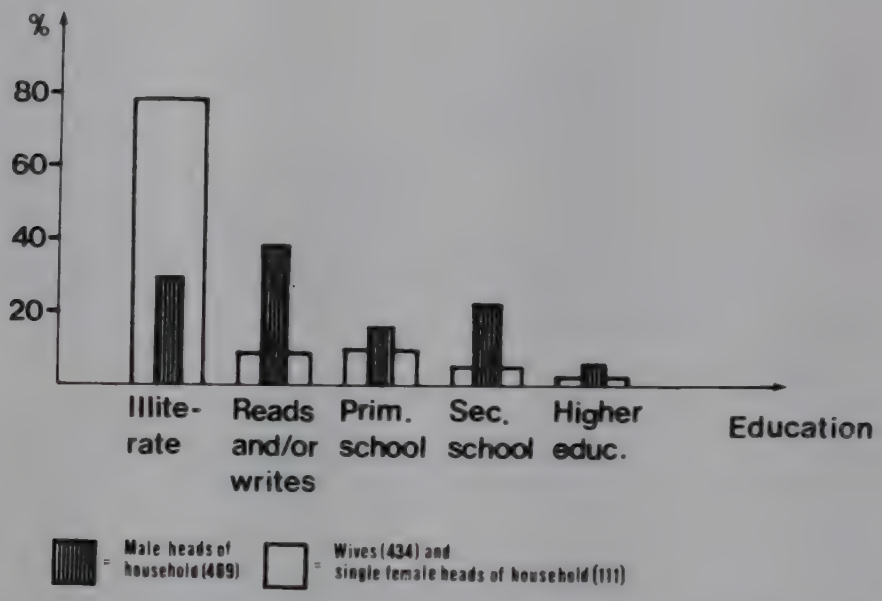

Figure 16. EDUCATIONAL STATUS of male heads of household as compared with wives and single female heads of household.

6. MIGRATION AND MOBILITY

The baseline study, 1972, included some questions to illustrate the in-migration to the area. The respondants in each household were asked in which province they were born, how many years they had lived in Addis Ababa and how many times they had moved within the capital. This information, however, was obtained only for the individual respondants of the 600 households. These were all adults, 258 being male or female heads of households, 321 wives and 21 other adults. It is therefore, with reservation that some results are presented and tabulated, as this group of respondants cannot be considered fully representative of the adult population of the sample.

The highest proportion of in-migrants (59 %) could be found in the Bole district of which Kirkos Sefer is part (9). The average figure for the Addis Ababa population in general was 55.7 % and in the adult population aged over 25 years 83.5 % were born outside Addis Ababa. In our group of

respondants 90 % were born outside the capital. This means that the majority of the children in Addis Ababa including Kirkos Sefer had parents who were born outside the city.

Of the 545 respondants born outside Addis Ababa the majority (42.6 %) were born in the neighbouring province of Shoa. The corresponding figure among all in-migrants in the 1967 population survey of Addis Ababa was 61.5 % (9). Compared with that survey our sample had a higher proportion of in-migrants from the northern provinces of Eritrea and Tigre - 40.5 % compared with 9.6 %.

The 1967 population survey of Addis Ababa found that 20.6 % of the whole population had lived in the capital for less than 5 years. In our study 18.6 % of the respondants had lived in Addis Ababa for less than 6 years. Tigrinya speaking people from Tigre and Eritrea seemed to be the most recent arrivals in terms of duration of residence in Addis Ababa at large and in Kirkos Sefer.

Seventy percent of the respondants had moved once or more within Addis Ababa, which can be compared with the report that about 75 % of the Addis Ababa population had moved to a new house between the years 1961 and 1967 (9). This high intra-urban mobility was also illustrated by direct observations made in our study. One year after the baseline study it was found that 28 % of the households had moved, the majority to other locations within Addis Ababa. Only 1.7 % of the households had moved outside the capital.

7. SOME MEDICAL VARIABLES

Weight for age is a common expression of children´s nutritional status. Weights of individual children may be related to mean values and variations in reference groups of children - or may be compared with reference standards based on normal materials. A convenient method, commonly used in developing countries, is to express weight as a percentage of the Harvard Standard (HS), the 50th percentile in a material of Boston children. This method was evaluated by Jelliffe in 1966 (48) and is presently used by the WHO (49) to classify

children weighing less than 80 % of HS as underweight and less than 60 % of HS as marasmic.

Frequency distribution according to this classification shows that, in the Kirkos material, underweight is rare during the first months of life but common after the age of 6 months (Figure 17). This pattern has also been shown in previous Ethiopian studies of underprivileged urban as well as rural village children (Figure 18) and has been attributed to early weaning, especially in urban children, and the lack of adequate weaning foods as well as a high frequency of infections. In contrast, privileged children, during the first years of life, follow approximately the same weight for age curve as North American children (19).

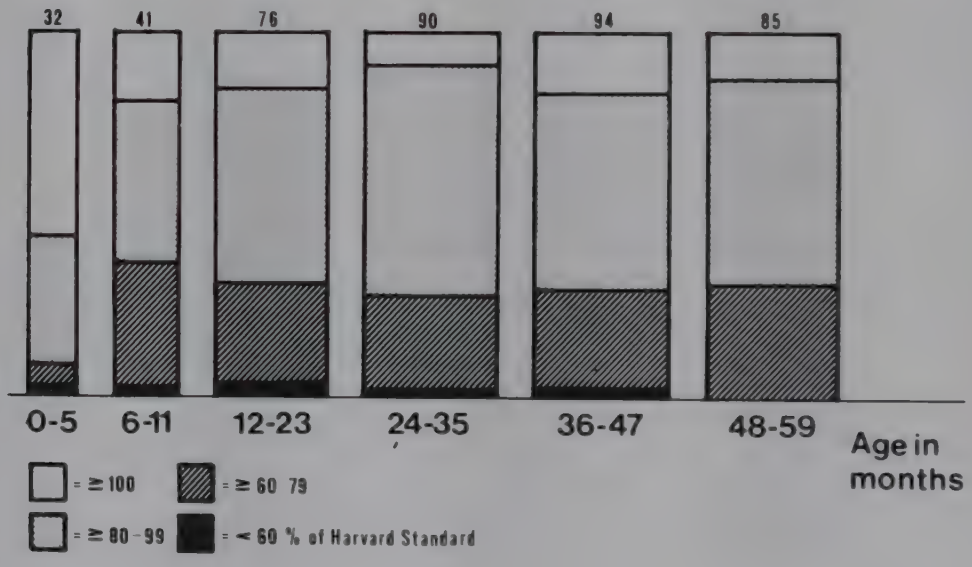

Figure 17. NUTRITIONAL STATUS. Percent of Kirkos children in different nutritional groups within each age category. Figures on bars denote no. of children.

A simultaneous comparison between different Ethiopian materials is not feasible due to the lack of standardized methodology with regard to classification of nutritional status, vaguely defined populations, sampling as well as measurement procedures. Table 6 compares the Kirkos material with two materials of underprivileged urban children and one of rural children in terms of absolute weight in different age groups. The Kirkos children are somewhat better off than the children in the other materials, which

could be expected, since the Kirkos community had a mixed social structure. This is also reflected in greater variations in weight and weight for age.

Table 6. NUTRITIONAL STATUS of Kirkos children compared with underprivileged Addis Ababa children (88) and rural Ethiopian children (3)

Age in months	Kirkos children				Underprivileged Addis Ababa children (88)			Rural Ethiopian children (3)		
	N	kg mean	s	kg mean	s	N	kg mean	s	N	kg mean	s
0- 5	32	5.6	1.3	102.5	19.3	93	5.1	1.1			
6-11	41	7.2	1.4	87.0	16.3	252	7.0	1.0	299	5.4	1.5
12-17	48	8.7	1.7	87.0	15.5	292	8.2	1.1			
18-23	28	9.5	1.5	82.7	12.6	241	9.2	1.2	154	7.9	1.5
24-35	90	10.7	1.7	85.0	13.9	241	10.6	1.4	103	10.1	1.8
36-47	94	12.7	2.0	87.1	13.5						
48-59	85	14.3	2.0	86.8	12.1				213	12.5	1.9

Age in months	Rural Ethiopian children (3)		
	N	kg mean	s
0- 5			
6-11	183	5.9	1.5
12-17			
18-23	76	8.5	1.5
24-35	63	10.5	1.8
36-47			
48-59	128	12.8	1.9

Average weights for age in % of HS can only be compared in an approximate way with the results given by Hofvander and Eksmyr (45) for urban privileged and underprivileged children. The Kirkos children seem to be closer to the underprivileged children (Figure 18).

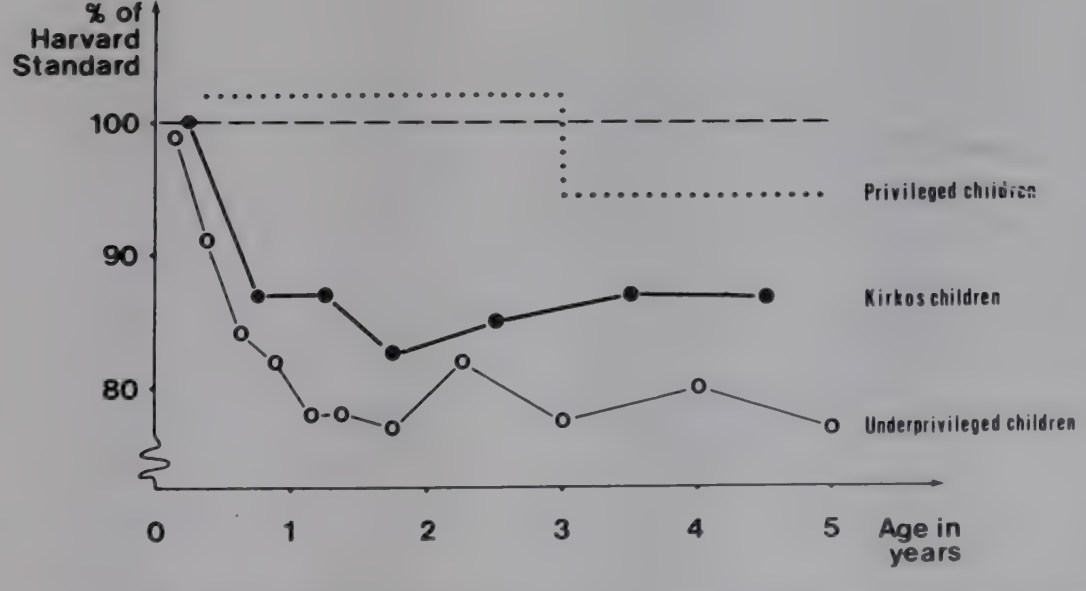

Figure 18. NUTRITIONAL STATUS of Kirkos children as compared with privileged (19) and underprivileged (45) urban Ethiopian children.

Weight development in terms of HS percentages can also be compared (Figure 19) with rural children studied by Dodge and Demeke (16). That material, however, was not based on a sample of children but rather on a sample of weight observations collected over a period of time. This procedure will bias the comparisons since lower and higher age groups will be underrepresented. This may have contributed to the fact that these children seem to be proportionally more malnourished in the higher age groups.

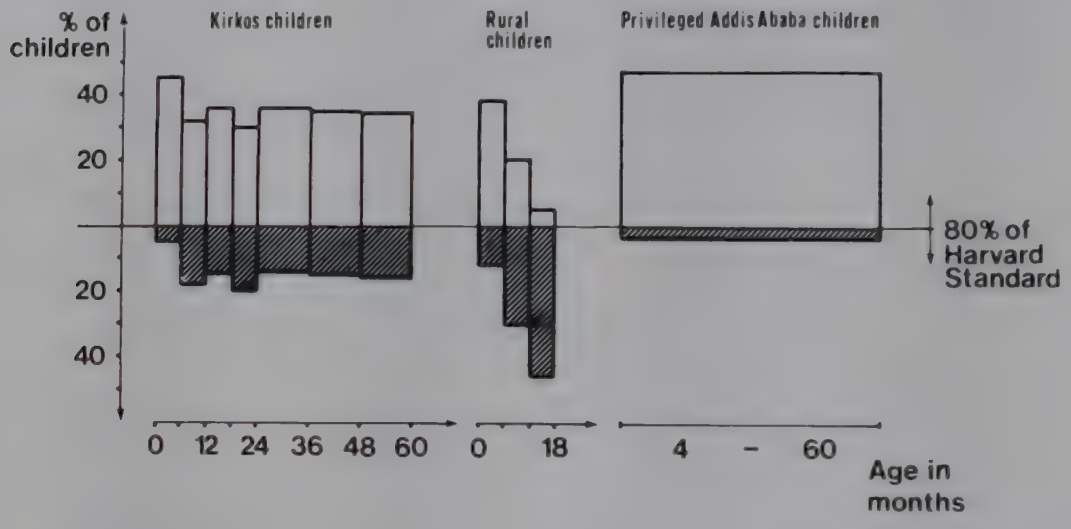

Figure 19. NUTRITIONAL STATUS of Kirkos children as compared with rural Ethiopian children (16) and privileged Addis Ababa children (19).

According to traditional customs prevailing all over Ethiopia, boys should be circumcised and girls undergo clitoridectomy. Another such practice is extraction of the milk teeth, which is supposed to cure diarrhoea. The traditional belief that the uvula may suddenly swell and suffocate small children explains the dangerous practice of cutting the uvula - often in connection with acute throat infections. These operations are usually performed by local medical men, "wogeshas" and "debteras" (58) without any form of hygienic precautions and "postoperative" complications often lead to hospitalization (12).

Prevalence figures for traditional practices are given in Table 7. Most of the boys had undergone circumcision at the age of one year. Female circumcision, clitoridectomy, seemed to be done somewhat later but both practices were often associated with uvulectomy and tooth extraction - in fact more

often than would be expected if they had been performed independantly of each other. The prevalences of various combinations are illustrated for male and female infants in Figure 20 . This raises the question whether information on these different practices could be combined into a measure of "traditionality" of the parents.

Table 7. Prevalence of different TRADITIONAL PRACTICES in percentages within age group and sex.

Age in months	0-5		6-11		12-23		24-59		60-		T o t a l		
Sex	M	F	M	F	M	F	M	F	M	F	M	F	M+F
N	23	7	24	18	46	38	148	145	250	267	491	475	966
Circumcision/ Clitoridectomy	78	0	58	56	80	68	77	74	89	87	82	79	81
Uvulectomy	57	29	58	39	65	76	71	72	72	79	69	74	71
Tooth extraction	26	0	33	22	37	55	47	47	47	52	44	49	46

Another traditional belief is the fear of the "evil eye" which explains the mothers´ reluctance to expose young children to sunshine and causes a high incidence of rickets in Ethiopian children. The attempt to investigate the prevalence of this harmful practice in the Kirkos area, was unfortunately not successful due to a high rate of non-response.

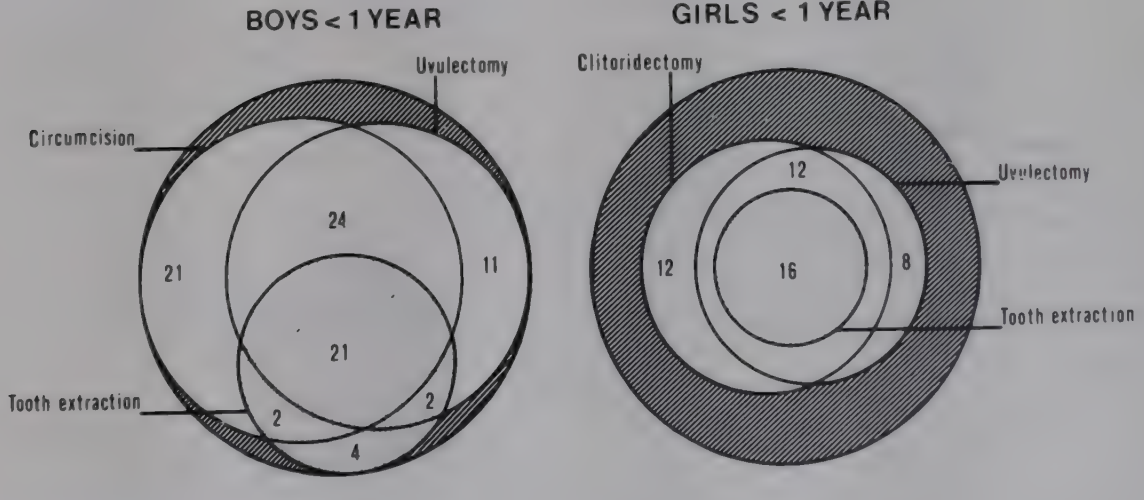

Figure 20. Pictorial illustration of the prevalence of different TRADITIONAL PRACTICES among male and female infants in the Kirkos study.Figures denote percentages infants who have undergone these operations or combinations of them.

Some information was, however, obtained about beliefs and practices with regard to measles, a severe childhood infection with a high mortality in Ethiopia as well as in other developing countries (25,28). It is for instance a widely held view that it is harmful for a measles child to be taken outside the house, e.g. to a clinic and to be given certain foods and fluids. Fluid restriction may be particularly harmful as measles children often suffer from severe diarrhoea. The results of the survey indicated that both traditional and modern ideas were prevalent - often simultaneously in the same individual. When asked about the cause of measles 16 % of the mothers were found to believe in supernatural causes - traditionally measles is thought to be caused by a spirit - and 19 % indicated a more modern outlook. (Table 8). A large proportion of the mothers, however, did not give any definite answer - possibly due to their reluctance of revealing their traditional beliefs. When asked how they would treat a child with severe measles, many mothers stated that they would seek medical help. This may partly have been due to an attempt at giving a pleasing answer but it is worth noting that 21.5 % of the mothers stated that they would keep the child at home or take it to the wogesha for uvulectomy (Table 9).

Table 8. KNOWLEDGE ABOUT CAUSE AND TRANSMISSION OF MEASLES. Percentage distribution based on information from 370 mothers.

Type of knowledge	%
Do not know	55.4
Traditional	15.9
Semi-traditional	10.0
Modern	18.7
Total	100.0

More detailed information about beliefs and practices concerning measles will be given in a later publication (26).

Table 9. ATTITUDE ABOUT TREATMENT OF A MEASLES CHILD. Percentage distribution based on information from 364 mothers.

Type of attitude	%
Would not take the child anywhere	9.6
For uvulectomy	11.9
To injector, dresser or pharmacy	0.8
To clinic or hospital	77.7
Total	100.0

The baseline survey also included questions about parents´ knowledge about vaccinations. Forty-six % of female or male guardians of children had no knowledge about the possibility of protecting children against any of four wellknown diseases (Table 10).

Table 10. KNOWLEDGE ABOUT VACCINATION aginst four diseases for which vaccinations were available:Tuberculosis.smallpox,whooping cough and tetanus.Percentage distribution based on information from 400 female or male guardians.

No.of known vaccinations	0	1	2	3	4
%	46.0	16.5	17.3	14.5	5.7

Fifty-four % of a group of mothers belonging to the home visit study knew about smallpox vaccination but only 28 % of them knew about vaccination for whooping cough and 6 % about protection against tetanus (Table 11). An attempt to evaluate the reliability of these figures is presented in chapter 5.

Table 11. KNOWLEDGE ABOUT SPECIFIC VACCINATIONS based on information from mothers belonging to the home-visiting group (baseline data)

Disease	Tuber-culosis	Smallpox	Whooping cough	Tetanus
N	143	144	138	137
% of "knowers"	33.6	54.2	27.5	5.8

In spite of this obvious need for health education many children had been given some form of vaccination, although this was not commonly practiced for the most needy age group - the infants (Table 12).

Table 12. VACCINATION. Percentage of children in different age groups vaccinated against at least one disease.

Age in months	0-5	6-11	12-17	18-23	24-59	60-	Total
N	32	45	53	33	299	524	986
% vaccinated	28	62	79	82	95	98	92

CHAPTER 4

ORGANIZATION AND PERFORMANCE OF THE KIRKOS MCH CLINIC

1. INTRODUCTION

The Kirkos area described in the previous chapter had no locally available health services for mothers and children.The opening of a simple MCH clinic at the same time as the baseline survey was carried out,was therefore favourably received by the community and probably facilitated its cooperation in the whole project.

The clinic was devised to test a "minimum package" MCH program in terms of organization, feasibility and performance with the aim of contributing to the current discussions on the realistic planning of MCH services with optimal use of limited resources. It was also realized that the combination in the project of clinical services and community surveys implied the possibility of measuring the clinic´s utilization by the community and its impact on community child health. This chapter, part of which has also been published elsewhere (31), describes the clinic´s organization, capacity and economics and discusses some practical implications of experiences that were gathered. Emphasis is put on the clinic´s child health program.

2. BASIC PHILOSOPHY OF THE CLINIC´S ORGANIZATION

The basic principles followed in the planning of the clinic were adopted from the "Under Fives Clinics" originally described by Morley (61,62) and discussed in general by Williams and Jeliffe (96) and for application in Ethiopia by Larsson (55). The following is a presentation of the main principles:

- Provision of health services with minimum staff and costs.

Staffing and costs in a test clinic have to be adapted in a realistic way to resources that would be available to similar clinics without the extra facilities of a research project.

- Location of services within easy reach of the population

It is unrealistic to demand from mothers of low income groups to walk long distances e.g. to use preventive services the value of which they may not understand.

- Integration of curative and preventive services

Most mothers are unfamiliar with the concept of prevention of illness. They seek medical help for their children when they are ill. Curative services must be provided to care for the needs that are perceived by the mothers. Consequently vaccinations and health education must not be separated from the curative programs if one is to achieve some extent of coverage.

- Definition of priorities

Emphasis should be put on the commonest preventable and curable conditions. One priority would e.g. be the health care of infants and young children, who usually suffer the highest morbidity and mortality.

- Streamlining the flow of patients

This must be done in order to care for large numbers of patients and to limit the waiting time for mothers.

- Use of the child health chart

A simple weight chart, originally introduced by Morley (63) has been used extensively in "Under Fives Clinics" in West and East Africa. Plotting the child´s weight in relation to a normal growth curve in a way that is easily understood by mothers and clinic staff helps in the early detection of malnutrition. If it is used as the only clinical record and kept by the mothers, a time consuming filing system in the clinic is avoided.

- Simple and repeated health education by all staff members in all contacts with mothers and children

Mothers may understand and be motivated to follow health education if it is related to concrete clinical situations and if it is given repeatedly. This implies that health education must be given in a very simple form and contain a few basic messages that can be conveyed by staff members of all categories.

- Nutrition rehabilitation by home visits

Orientation of nutrition rehabilitation to the patient´s home situation may be an effective and economic way of influencing feeding practices. Nutrition rehabilitation in hospitals and clinics has often failed as the mothers tend

to attribute cure to the drugs given and as the expensive supplementary foods given free at a clinic are not available to them at home.

- Delegation

To care for large numbers of patients with limited staff and economic resources means that qualified medical work must be delegated to staff with relatively low medical qualifications. The doctor´s role will be that of a supervisor and teacher and the duties normally filled by him will be performed by a nurse or a dresser, whereas medically untrained auxiliaries will be taught to carry out duties such as weighing of the children, administration of drugs and vaccinations.

- Community involvement

The services must be geared to the needs perceived by the community to achieve their participation and good will.

3. DESCRIPTION OF THE CLINIC AND ITS ORGANIZATION

The clinic was established in March 1972 and located close to the Kirkos area. A simple house was made available by the Municipality of Addis Ababa and provided with a sheltered waiting area and simple furniture (Figure 21). The only medically trained staff were a community nurse responsible for the day to day running of the clinic, and a dresser. They examined the patients, prescribed simple treatment and supervised the other staff (See Appendix) who were trained on the job - the guards to direct the patients, the cleaners to issue child weight charts, to weigh the children to administer,treatment etc. No laboratory facilities were installed.

Special attention was paid to the flow of patients inside the clinic which consisted of only one big room (Figure 21). The mothers were placed according to their arrival numbers in the waiting area and were then shown by the guards into the clinic, where they moved along benches. At the first station children´s weight was measured and plotted on the child health charts (Figure 22). They were then examined by the nurse or the dresser, who when necessary prescribed simple treatment, which was administered by an auxiliary at the next station. Before leaving the clinic, all the children

were seen by the vaccination team which provided the needed immunizations. The main part of the daily activities were devoted to child care and only one day a week to antenatal care and family guidance (see Appendix). During Wednesdays the staff was reinforced by a mobile vaccination team from the ESPC (42).

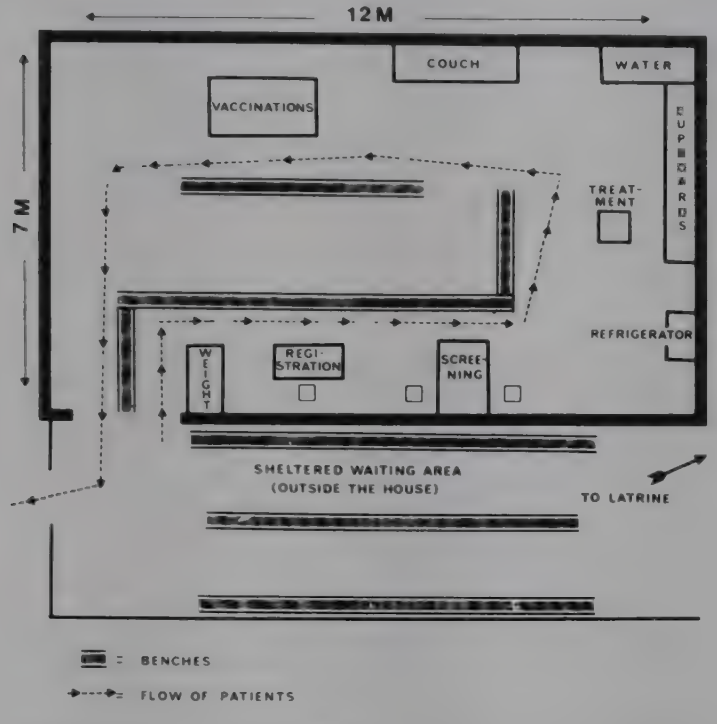

Figure 21. Diagram of the Kirkos MCH Clinic

An Ethiopian edition of the weight chart (here called Child Health Chart), originally described by Morley (63) was issued to all children under the age of 4 years. Its use is illustrated in Figure 22 . Older children were given simple cards for clinical notes and antenatal patients special cards. All cards including a firm plastic cover were bought for a nominal fee and kept by the mothers. As no records were filed in the clinic some statistics were gathered during special study weeks.

The nutrition and health education programs of the clinic were designed to stress well-defined and realistic points, such as vaccinations, breastfeeding and food supplementation from the age of 6 months using, as much as possible, locally available cheep food stuff. The main part of the health education was carried out by staff members of all categories during their daily clinical contacts with the patients, but special sessions were also organized for

appointed at risk patients. Teaching sessions in the local schools, carried out by the dresser, and in the Women's club, conducted by the nurse, were used to extend the same message to the community.

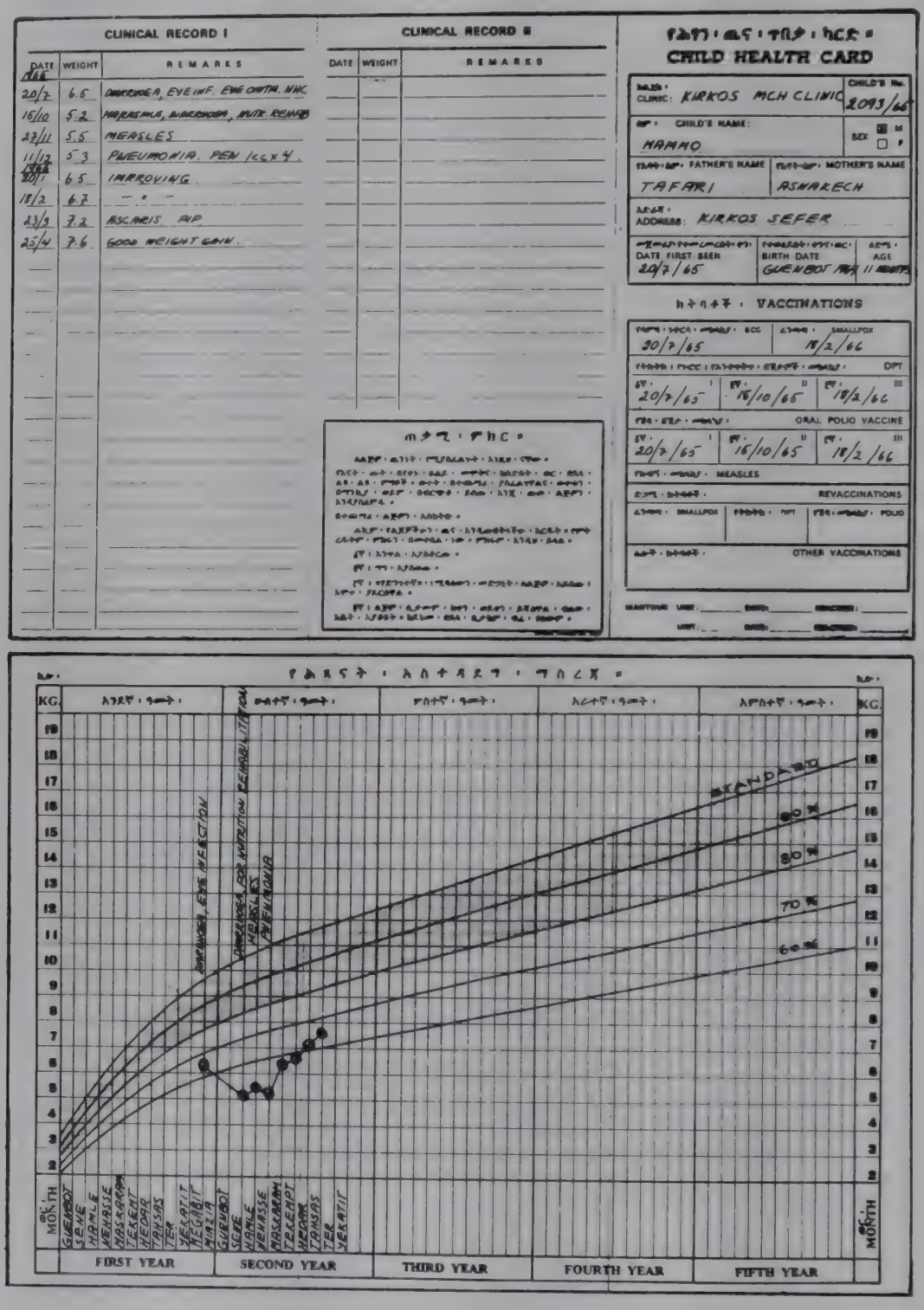

Figure 22. Child Health Chart. The page with the weight curve shows its use in a case of marasmus. The standard weight curve follows the 50th percentile of the Harvard Standard (48,49). The names of the Ethiopian months are used. The reverse page, used for clinical notes, was used as the source of information on community utilization of the clinic.

Nutrition rehabilitation of severely marasmic children (under 60% of the standard) was organized on a home visiting basis. A local housewife was employed to carry this out after being taught about childhood nutrition and inexpensive locally available weaning foods.

The supervising physicians regularly saw problem cases *together* with the nurse and the dresser towards the end of Wednesday Clinics, which were completely devoted to child care, and during antenatal sessions. They also took part in the supervision of routine activities of all the staff members. Most practical problems and disagreements could be solved in a good team spirit during staff meetings.

Attention was also paid to the importance of community involvement in the clinic. The clinic was started after consultations with the district governor at a meeting with the central committee of the Edder groups (43). Their positive interest was also manifested by visits to the clinic. The fact that community people were among the staff members of the clinic may also have facilitated the acceptance and cooperation of the mothers. The staff was also ready to listen to suggestions from the mothers attending the clinic This was examplified by the nurse who on the mothers´ demand included a simple teaching program of functional literacy in the Women´s club.

4. STATISTICS ON PATIENTS AND ATTENDANCE RATES

The community was actively informed about the clinic only during the baseline surveys that were carried out at the time of its establishment. The attendance rates shown in Figures 23 and 24 indicate the spontaneous utilization of the clinic by the community, and may also be indicative of the latent need for child health services.

Figure 23 shows the attendance rates at the Wednesday clinics during the first 18 months (80 weeks). After a period of about 14 weeks they had stabilized around 250 per Wednesday.

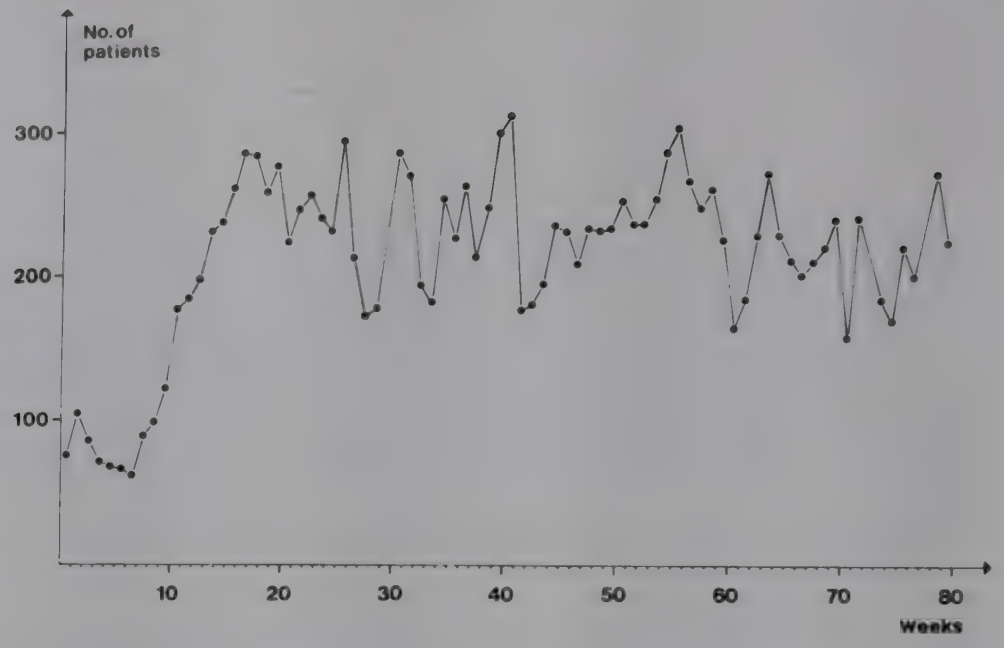

Figure 23. Attendance rates at the Wednesday clinics during 80 weeks after the opening of the clinic.

Figure 24 illustrates the development of overall attendance rates in the clinic´s child care programs during a three year period. During the first 18 months the clinic was run as part of the Kirkos project and statistics were collected on a weekly basis. Later (after the dividing line in Figure 24) the management was changed and statistics collected on a monthly basis. Attendance rates have therefore been calculated as the average number of weekly attendances during monthly periods after the opening of the clinic. During the latter 18 months the clinic´s organization remained basically the same. The antenatal program was, however, extended and the staff was increased by one nurse.This may also explain the increased attendance rates in the child care programs.

During the initial 18 months period 39,487 visits were paid by 9,421 children who had been registered at the clinic, which means an average attendance rate of 2.8 per child and year. Sixty percent of these children were under the age of 4 years. Children under the age of one year were responsible for 27 % of the attendances which means that younger children on an average visited the clinic more often than older children.

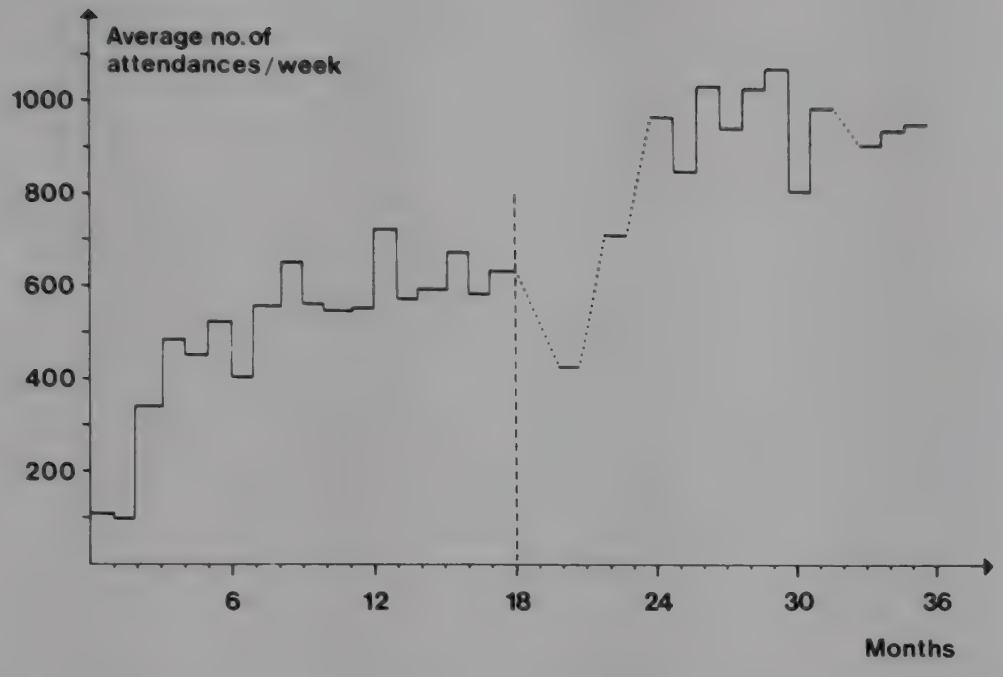

Figure 24. Overall attendance rates at the clinic's child care programs during 36 months after the opening of the clinic. After the dividing line the management of the clinic was changed and another nurse added to the staff.

The clinic's catchment area was studied during one week. The Kirkos area supplied 60 % of the patients and only 14 % came from a distance of more than one kilometre.

The system of using child health charts kept by the mothers as the only records for children was studied especially during the initial period after the opening of the clinic. Thus, during a 6 month period when 12,500 child attendencies were recorded, loss of weight charts were recorded in only 10 instances.

Table 13 shows the attendance rates at the different programs of the clinic during a one-year period (week 19-70). Approximately 3 % of the children had to be referred to hospital. One fourth of these children had gastroenteritis and needed parenteral rehydration.

Table 13. NUMBER OF ATTENDANCES AT VARIOUS PROGRAMS OF THE CLINIC DURING A ONE YEAR PERIOD 1972-1973 (week 19-70). (Averages for the different programs have been calculated for the particular periods or days they were in operation).

	No. of attendances	Average
Wednesday clinics (Sick children, revisits, vaccinations etc.)	11,840	232/Wednesday
Other morning clinics (Sick children)	6,249	21/day
For treatment only	8,510	28/day
Nutrition and health education (Special sessions for children at risk)	1,741	33/week
Home visits for nutrition rehabilitation	983	19/week
Other home visits	112	2/week
Women's club	631	18/session
Antenatal clinics	2,053	42/session
Family planning	400	8/session
Total	32,519	107/day

Fiftyeight per cent of the children attending the Wednesday clinics (Table 13) were given one or more vaccinations during their visit. Information about type and number of vaccinations is given in the Appendix.

Table 14 . DISTRIBUTION OF DIAGNOSES AMONG 294 CHILDREN UNDER THE AGE OF 5 YEARS SEEN DURING ONE WEEK.*

Diagnosis	No.	%
Healthy (weight over 80 % of HS, no illness)	55	18.7
Underweight (weight 6-79 % of HS)	130	44.9
Marasmus (weight under 60 % of HS)	13	4.4
Kwashiorkor	5	1.7
Gastroenteritis	70	23.8
Upper respiratory tract infection	53	18.0
Ascariasis	28	9.5
Eye infection	26	8.9
Tonsillitis	17	5.8
Skin infection (mainly impetigo)	16	5.4
Pneumonia	12	4.0
Otitis	8	2.7
Measles	8	2.7
Whooping cough	4	1.4

* There may be more than one diagnosis for each patient

Table 14 shows the pattern of diagnoses among 294 children under the age of 5 years seen during one week. Thirtysix percent had one diagnosis, 35 % had two and 9 % had three diagnoses. Table 15 shows the nutritional status of the same children.

Table 15. WEIGHT FOR AGE of 294 children under the age of 5 years seen during one week.

Weight group % of Harvard Standard	Number of children	%
100	20	6.8
90-99	39	13.3
80-89	90	30.6
70-79	97	33.0
60-69	35	11.9
60	13	4.4
Total	294	100.0

The supervision of the Nutrition Rehabilitation program was not satisfactory and statistics were only compiled during a 6 months period. During this time only 12 patients were followed up for 3 months or more. Eight of these had an acceptable weight gain (weight for age increased by 4-18 %).

The school teaching program, carried out during the year after the opening of the clinic, covered about 4,000 school children attending two large government schools and 6 small community schools.

5. ECONOMICS OF THE CLINIC

Table 16 gives an account of the total budget of the clinic during a 6 months period (week 14-40). The service was free except for a charge of Eth. $ 0.25 for weight charts (net costs 9.1 cents) and other clinic costs. The budget includes the value of house rent (Eth.$ 50 per month) and capital investment costs. Approximately Eth.$ 500 were invested in equipping the building.These costs would have amounted to about Eth.$ 1,500 if only new material had been used. Salaries of physicians were calculated according the Ethiopian scale.

During the period the clinic had 13,733 attendances at the child care and 1,141 at the maternal care programs. The proportions spent on different items in the total budget of Eth. $ 10,473 are given in Table 16 . To arrive at the cost per child,attendance the expenditure on drugs and vaccines was divided according to what was used for child and maternal care. Salaries and other running costs were divided in proportion to the time allotted to each of the two programs. Nutrition and Health Education sessions, Women´s club and the home visiting program were considered to be part of child care in the analysis. Had free UNICEF drugs been used,the drug costs would have been reduced by about 25 %, corresponding to 3 % of the clinic´s total budget. Due to the fact that the main cost involved in the Nutrition Rehabilitation Program was the salary of the auxiliary, the cost per rehabilitated child could be calculated at Eth. $ 35.

Table 16. BUDGET AND COST PER ATTENDANCE AT THE KIRKOS MCH CLINIC DURING A 6 MONTHS PERIOD (week 14-40) (from the 4th to the 9th months after the opening of the clinic)

Expenditure	Eth. $
EXPENDITURE	
Salaries	8,195
Drugs and vaccines	2,080
Other running costs	1,122
Total	11,397
INCOME	
Child health charts and antenatal charts	924
BALANCE	10,473
COST PER ATTENDANCE	
Child care	0.58
Maternal care	1.72

6. COMMENTS

The organization of the clinic enabled two medically trained health workers with the assistance of some auxiliaries to care for a great number of patients (Table 13).

Integration of preventive and curative services was possible as evidenced by the fact that about 60 % of the patients attending the children´s clinics were immunized. An evaluation of the health education cannot be based on the statistics from the clinic.

The introduction of the child health chart was successful from the point of view of the clinic. Extremely few reported loss of the cards. The staff utilized the charts extensively to detect children in danger of developing malnutrition and to follow the effect of treatment and advice.

Exact statistics cannot be provided with a system in which medical records, child health charts and other clinic cards are kept only by the patients. Adequate statistics on e.g. disease pattern could, however, be obtained during special study weeks (Table 13 and 14). This pattern corresponded to that encountered in other MCH centres and hospitals in the city (89). It may be noticed that the proportion of malnourished children was higher among children coming to the clinic than among the children studied in the community (Figure 17).

The preliminary experience from the Nutrition Rehabilitation Program indicated that it was difficult to rehabilitate severely marasmic children. It would probably have been more rewarding to deal with moderately malnourished children (85).

The Kirkos clinic had the capacity of caring for 29,500 attendances by children per year (Table 13). A tentative minimum child care program with basic health care and vaccinations recently discussed in Ethiopia (87), aimed at 3 clinic visits per child during the first year of life, one per year for the next four years and allowed for one visit per child because of illness per year for all age groups. Calculations based on the age distribu-

tion among the children in the Kirkos community (Figure 11) and the attendance figures mentioned above indicate that the Kirkos MCH Clinic would have the capacity of delivering a child health program to a population of 52,000 at an annual cost of 17,000 Eth.$ (with a cost per child visiit of Eth.$ 0.58). Assuming the same age distribution for the whole population of Addis Ababa of around 1 million inhabitants, 19 such MCH clinics at an annual cost of around Eth.$ 325,000 would be needed to cover the whole city with child care programs.

The total number of children´s attendances at 4 larger MCH centres in Addis Ababa during 1972 was 175,000 at a cost of Eth.$ 215,000 (2). The cost per attendance of Eth.$ 1.23 can be compared with the lower cost of Eth.$ 0.58 at the Kirkos Clinic (Table 16). Comparative figures were obtained without paying attention to the quality of care, which may have been more comprehensive in the larger MCH centres. If child health services of Addis Ababa were to be covered by MCH centres of this kind, 13 such centres would be needed at an annual cost of 700,000 Eth.$.

A system of simple MCH clinics, of the type described in this chapter, would be less expensive and it seems reasonable to recommend that an expansion of the city´s child health services should be based on clinics of this type. MCH centres and hospitals already established could provide supervision and referral services. An active community involvement in the organization of MCH clinics of the type described above may also be envisaged as the investment costs are very low and as they can be located within easy reach of mothers and children.

The above recommendations are only based on statistics from the clinic. The Kirkos study, however, also provided information about community health needs, especially in terms of acute morbidity, and community utilization of the clinic. These data are presented in the following chapter and are discussed more extensively in two other publications (27,94).

CHAPTER 5

FOLLOW-UP DATA— COLLECTION AND EVALUATION PROCEDURES

1. INTRODUCTION

Chapter 4 describes baseline cross-sectional data from the initially sampled 600 households. The aim of this chapter is to present follow-up data, especially from the 411 households with children, and to discuss methodological problems in their recording and evaluation.

Follow-up information may be obtained either at one point in time after or continuously during a particular study period. The data obtained may be used to generate aggregated measures of events that have taken place or to describe them in terms of a process.

Aggregated measures of mobility, birth rate, mortality, utilization of the clinic as well as of changes in knowledge about vaccinations taking place during the one-year study period were based on information obtained at the follow-up study in 1973. Data from this survey were also used in the study of the reliability of age reporting and weight for age measurements.

Data on disease incidence and weight development, collected during a continuous series of observations of individual children, were used to generate aggregated measures of childhood morbidity and nutritional status as well as to study the process of interaction between these two components.

The 1975 survey used continuous but retrospective data obtained from the child health charts to measure the process of community utilization of the clinic over a period of 3 years.

2. PROBLEMS OF NON-RESPONSE.

At the 1973 follow-up survey, aimed at the initial sample of 600 households, the main reason for non-response was the high mobility rate. Thus 28 % of the original households had moved, most of them to other parts of the capital

(Table 17). Moreover, 10 % of the households were absent at the follow-up interview or refused to take part in it and finally 4 % could not be identified (Figure25). Similar distributions of reasons for non-response were found within the group of 411 households with children and for the group of 1,020 children, who are in the centre of interest of this study.
This raises the question to what extent inferences are possible from the response group to the sample.

Table17. MOBILITY AS A CAUSE FOR NON-RESPONSE in 578 households at follow-up survey in 1973. (22 of the 600 households were not identified).

	No. of households	%
Moved within Addis Ababa		
to other part of Kirkos Sefer	49	
to other part of Addis Ababa	70	
Moved outside Addis Ababa	10	27.9
Moved, but not known where	32	
Did not move	417	72.1
Total	578	100.0

It should be noted that the problem of non-response was not encountered in the baseline cross-sectional study but only in the collection of incidence data at various follow-up studies, the baseline data still being available both for the response and the non-response group. This limited the possibility of applying methods, commonly used in cross-sectional studies, to reduce the magnitude of non-response. Another characteristic of this study is that incidence data are not only used to create descriptive measures but also to use these as criterion variables in relation to sets of background variables. The validity of inference should therefore be considered in both these respects.

The availability of baseline data makes it possible to compare the non-response group with the response group in terms of background variables. Similarities in these respects are often - on a very slight foundation - taken as justifications to consider non-response effects as negligible. Such conclusions are,

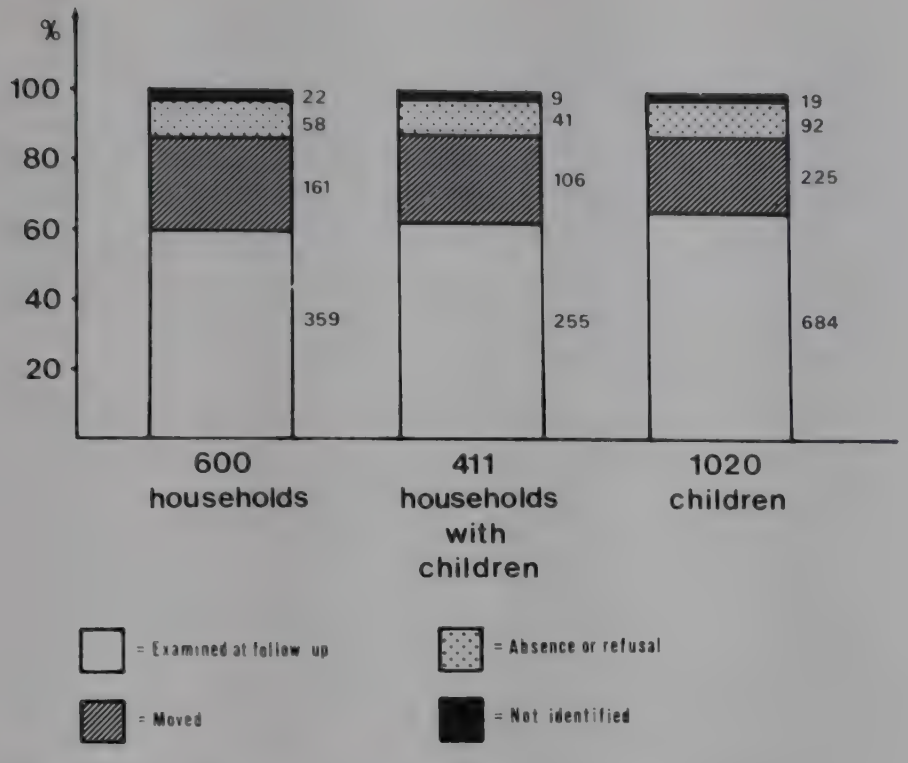

Figure 25. TYPES AND MAGNITUDE OF NON-RESPONSE at follow-up survey in 1973. Figures to the right of diagrams = frequencies.

however, hazardous if the correlation between the tendency for non-response and the outcome of the criterion variable is not known. Biases can arise both in the estimation of aggregated measures and in the determination of inter-relationships between variables. Knowledge about characteristics of the non-response group is, however, useful in the evaluation of aggregated measures. Assuming the same kind of interrelationships between the variables in the response and the non-response group, bias in the estimation of a criterion variable is indicated if, for instance, a determinant for non-response tendency is also correlated to the criterion variable. Therefore, these aspects have to be considered for each specific criterion variable in the measurement of e.g. morbidity, nutritional status and utilization of the clinic.

Comparing the response and the non-response group, at the follow-up survey in 1973 among the 411 households with children, indicated that they were quite similar, except with regard to variables expressing size of household and standard of housing. Non-response was associated with small size of household and low housing standard, factors which also seemed to determine mobility, as the same pattern was found in a comparison between mobile and

non-mobile households (See Appendix). Housing conditions were also given as the main reason for moving within Addis Ababa by a group of respondants at the 1972 baseline survey, whereas health reasons were mentioned by very few. Neither was there any other evidence, based on the practical experiences during the various surveys, of any correlation between mobility - the main reason for non-response - and criterion variables expressing health of children such as morbidity and nutritional status.

3. RELIABILITY OF INFORMATION ON AGE AND WEIGHT FOR AGE

In addition to non-response problems, observational difficulties may invalidate the results of a survey e.g. due to communication problems in the interview situation. Common obstacles are the interviewee´s lack of knowledge and suspiciousness (5,69).

Previous Ethiopian studies show that few people have exact knowledge about their age. Höjer and Nordberg (47) and Woubbie and Taube (98) compared three different sources of age information for a group of rural Ethiopian school children: "official age" given in the original class-rolls, "modified age" given by the individual and "home-visit age" given by the individual´s family in a personal interview. "Modified age" was systematically reported higher than "offical age", a tendency increasing with age.

In an anthropometric study by Eksmyr (20) of privileged Addis Ababa school children, exact birth date could be confirmed (by delivery records) in only 3.4 % of the children. Using other sources of information, questionnaires and physician estimation and by requesting the parents to relate the birth to some wellknown event, the ages of another 46.2 % could be satisfactorily assessed. For the rest of the children age information was inconsistent. Thus, deviations exceeding one year, were found in 12.5 % of the children.

The Kirkos study offered an opportunity to compare the age recorded at the baseline survey in 1972 with the age as reported at the follow-up survey one year later. This comparison was made for all children with two age recordings. The following aspects will be considered in the discussion about age information:

- the degree of consistency in age reporting based on the two types of information as a function of the baseline age information
- the effects of unreliable age information on measures of weight for age
- the possible influence of socio-economic characteristics on inconsistency in age reporting.

3.1 Degree of inconsistency in age reporting

The consistency in age reporting could be measured for 649 children with two age recordings. This is illustrated in Figure 26 which uses an age classification with half-year intervals in the age group 0-2 years and whole years in older children. The consistent classifications appear in the main diagonal (46.4 %). "Negatively inconsistent" observations, which means that age was *either* overestimated in 1972 *or* underestimated in 1973 (45.0 %) appear in the lower triangle. Only 8.6 % show the opposite, "positive inconsistency".

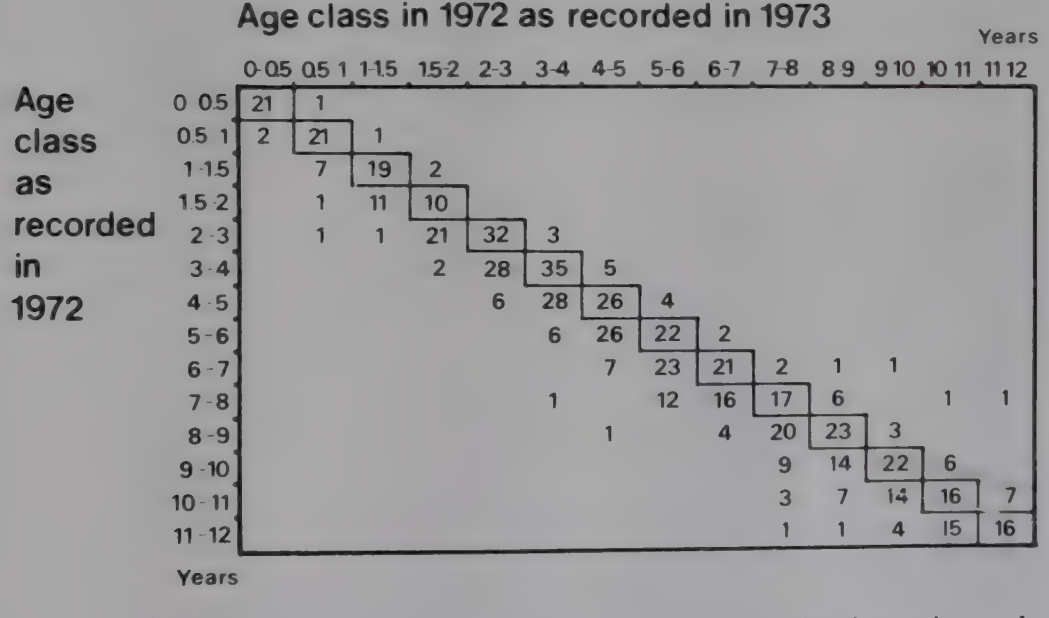

Figure 26. INCONSISTENCY IN AGE CLASSIFICATION based on information from the baseline survey in 1972 and the follow-up survey in 1973.

This significant pattern is found in all the separate age groups (Table 18). There is no ready explanation for this discrepancy. The fact, however, that the degree of inconsistency increases with age, justifies the use of the earlier age recordings.

Table 18. Degree of INCONSISTENCY IN AGE CLASSIFICATION BY AGE GROUP. "Negative inconsistency" = age overestimated in 1972 or underestimated in 1973. "Positive inconsistency = age underestimated in 1972 or overestimated in 1973.

Age in 1972 in years	N	Consistency (%)	Negative inconsistency (%)	Positive inconsistency (%)
0- 1	46	91.3	4.3	4.3
1- 2	50	58.0	38.0	4.0
2- 3	58	55.2	39.7	5.1
3- 4	70	50.0	42.9	7.1
4- 5	64	40.6	53.1	6.3
5- 7	111	38.7	55.9	5.4
7- 9	105	38.1	51.4	10.5
9-12	145	37.2	46.2	15.9
Total	649	46.4	45.0	8.6

A correlation study was also performed to measure the extent to which the two age recordings differ and how these differences are related to age as reported at the baseline survey. Scatter diagrams and regressions are shown in Figure 27 for age groups 0-1 and 1-2 years respectively.

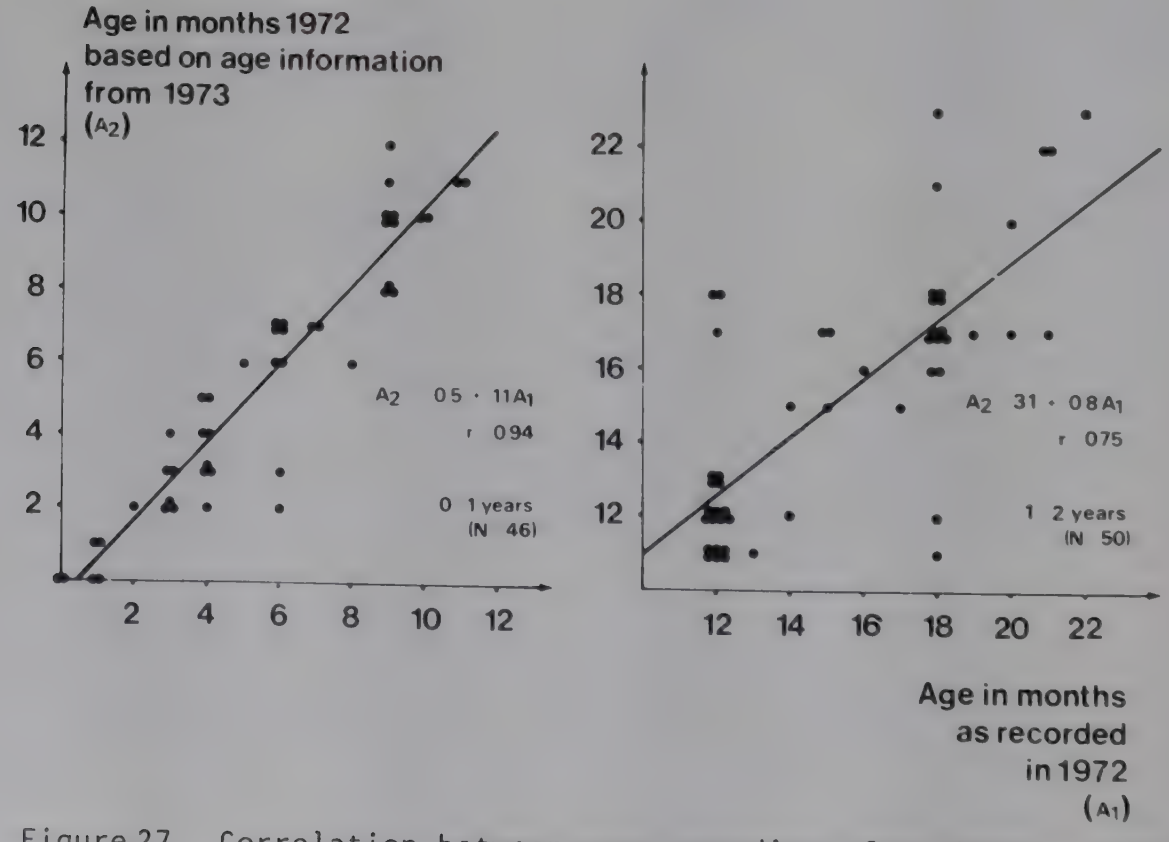

Figure 27 . Correlation between age recordings from 1972 and 1973 in the age groups 0-1 and 1-2 years.

The consistency is almost perfect in the younger age group as reflected by an equation $A_2=-0.5+1.1\ A_1$ (A_1 = age in months as recorded in 1972; A_2 = age in months 1972 based on information from 1973), a correlation coefficient of 0.94 and a residual dispersion about the line of 1.2 months. The fit is considerably poorer, however, already in the age group 1-2 years.

3.2 The effects of unreliable age information on measures of weight for age

When weight for age is used to assess nutritional status of children, unreliable age information may have secondary effects on the precision of this measure. Figure 28 illustrates that it is very important to have exact age information on infants; despite the lower reliability of age information in the age group 1-2 years, this does not affect the precision of the measure of weight for age to any large extent. Thus, the lower age reliability is compensated for by the lower growth rate (in kilograms per time unit) in older children.

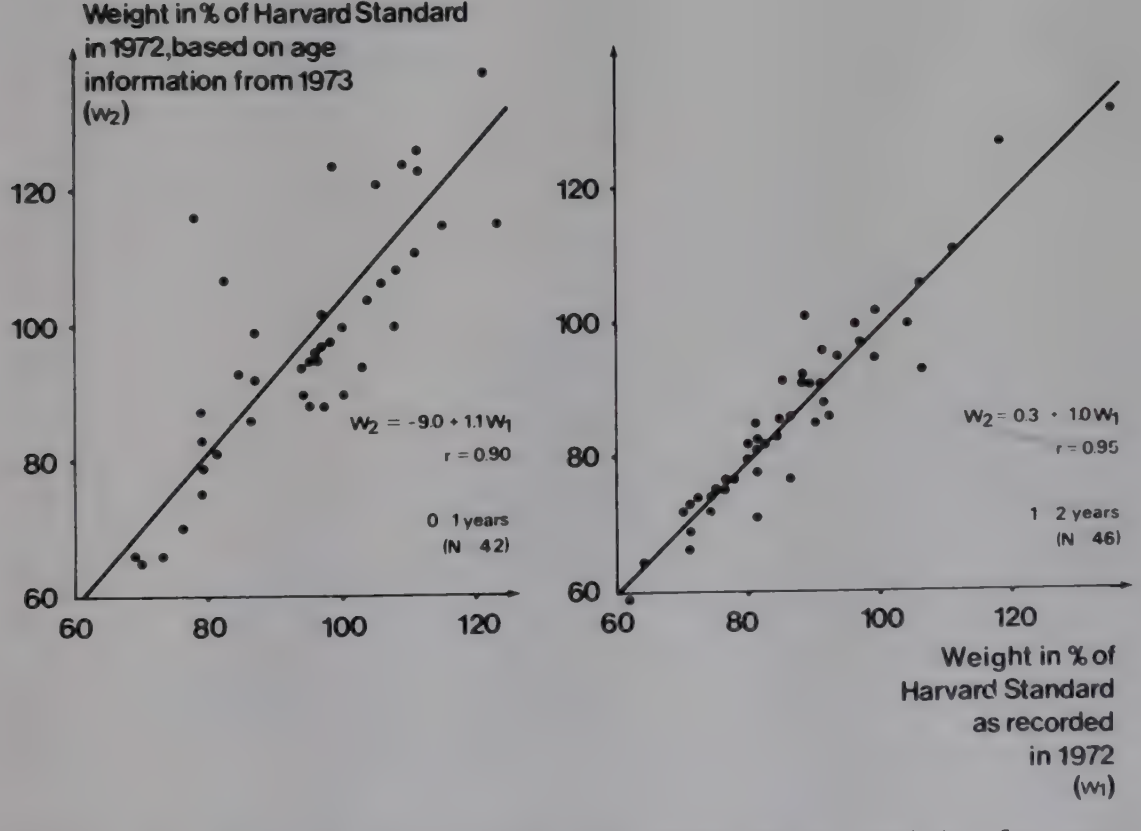

Figure 28. Correlation between two measures of weight for age, based on one weight recording from 1972 and two age recordings from 1972 and 1973 in children aged 0-1 and 1-2 years.

A practical conclusion would be that,despite decreasing precision of the age measure with increasing age, this has no serious effects upon the precision of the weight for age measure. It therefore seems justified,from this point of view,to use weight in % of the Harvard Standard as an expression of nutritional status in the further analysis of more specific problems related to child health.

3.3 Exploration of important factors for inconsistency in age reporting

As shown in Figure 27 there was a greater inconsistency in age reporting for children 1-2 than in those 0-1 year old. This is also demonstrated by Figure 29 where mean inconsistencies, regardless of their direction, are shown to be 1.6 and 0.9 months respectively. In the age group 2 years and above, age was not (with few exceptions) reported closer than to the nearest half-year. Figure 30 thus illustrates that 10.9 % of the observations in the age group 2-5 years were inconsistent by one year or more while the corresponding figure in the age group 5-12 years was 30.7 %. In the latter group 21.2 % of the age reportings were inconsistent by more than one year - the corresponding figure for privileged children in Addis Ababa as reported by Eksmyr (20) was 12.5 %.

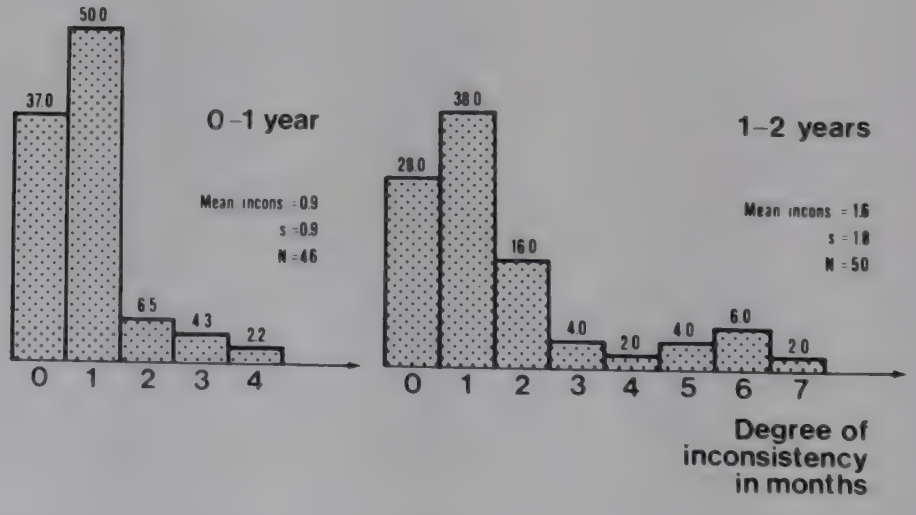

Figure 29. Degree of INCONSISTENCY IN AGE REPORTING in age groups 0-1 and 1-2 years. (Figures on bars denote percentages of sample).

In order to explore possible influence of socio-economic background factors on the tendency for erroneous age reporting, six household variables have been related to measures of inconsistency:

- whether the mother was the respondant on both occasions or not
- household income
- education of female guardian
- age of female guardian
- ethnicity
- religion.

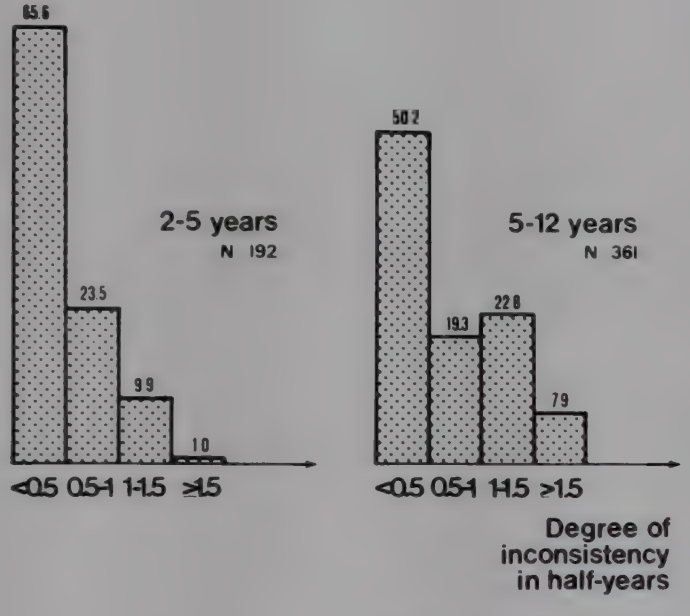

Figure 30. Degree of INCONSISTENCY IN AGE REPORTING in age groups 2-5 and 5-12 years. (Figures on bars denote percentages of sample).

The only interpretable differences seem to exist in the age group 1-2 years in which reliability is positively related to household income and literacy. To some extent these differences also prevail in the age groups 2-5 and 5-12 years (See Appendix). The results in these age groups also indicate that the oldest and the youngest mothers are the least consistent in their age reporting. There is also a striking but unexplained difference between the Tigre and the Amhara groups, the former being considerably more consistent.

4. MEASURING MORBIDITY

When using longitudinal series of observations for the measurement of morbidity in this study, two main problems were encountered:

- the assessment of validity and statistical precision of the measure
- the handling of incomplete longitudinal series of observations due to dropouts.

The morbidity observations in this study were carried out by staff, who had no previous medical training (SSW students). As in a similar study in Guatemala (82), these non-medical fieldworkers were instructed not to volunteer medical or nutritional advice. If this was requested by the mothers they could, however, refer to the MCH-clinic. Using medically trained observers would imply more detailed information about morbidity (diagnosis, degree of severity). On the other hand it would conceivably have meant greater interviewer bias as well as considerable influence on medical and health matters as a medical professional can hardly abstain from interfering of ethical reasons when discovering untreated illhealth. The use of nonmedical observers was therefore considered to have two advantages: active medical interference was avoided, which was considered to be ethically justified as the families were given access to a new local MCH-clinic, *and* uniformity with regard to a simple classification of symptoms and illness could be expected from the interviewers.

Children were recorded as "ill" or "not ill" at the time of the home-visits according to the mother´s report, checked by the home-visitor when possible. If the child was ill, the main symptoms were recorded. This allowed a subclassification of illness into the main groups of gastroenteritis, respiratory infection and other conditions. For each child morbidity was expressed as the proportion of the total number of visits at which the child was recorded as ill. Thus, morbidity, as expressed in percentage, represented the total load of illness during the year. In order to assess the statistical precision, the following has to be taken into account:

- For the individual measure, there is one sampling error involved due to the systematic sampling of interview occasions. The precision is a function of the intensity in homevisits and the length of the observation period. Als

assumptions about mean duration of illness have to be made.

- For the group measure, an additional sampling error is introduced, caused by the sampling of children.

The model underlying the estimation procedure is derived and evaluated in another publication (95), which also discusses and illustrates the relative merits of various changes in design of the survey. It is shown that, for the group measure of morbidity, the precision is quite satisfactory and that there is little to be gained from increasing intensity above that of fortnightly home-visits, if a one-year survey is maintained. The question of allocation of resources for different cost-functions is also illustrated.

For the purpose of evaluating the statistical model used, a supplementary study was undertaken in 1975, arranged as a daily home-visit study during two months. Information was obtained about the duration as well as frequency of acute diseases as well as of the mothers´ ability to recall illnesses.

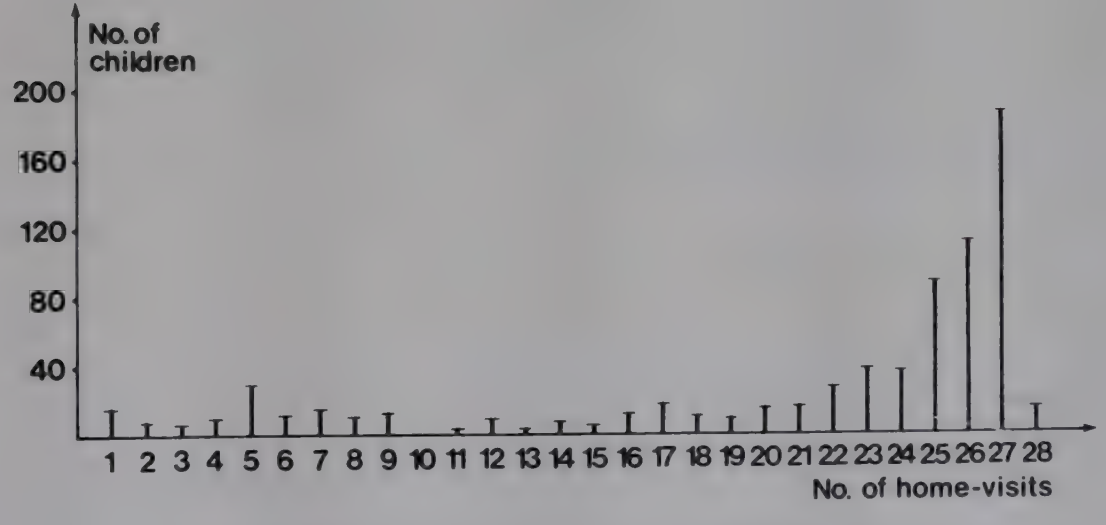

Figure 31. Frequency distribution of NUMBER OF HOME-VISITS.

The problem of incomplete longitudinal series of observations is also discussed from a theoretical point of view and decision rules are derived as to when information about a child´s morbidity should be included in the group measure of morbidity (35,95). It is shown that, in this material, maximum precision is

obtained when all children covered by home-visits during at least 60 % of the year are included. This implies that, for a total measure of morbidity in the material, 572 out of 749 children belonging to the home-visit study will be used. The remaining 177 children lack information in varying degrees due to mobility, refusals, absences etc. Despite the lower precision that will be obtained for this group with regard to the measure of morbidity, a comparison between the two materials is nevertheless relevant. The large variations in number of home-visits performed (Figure 31) motivate a weighing procedure if all the 749 children´s morbidity data should be utilized.

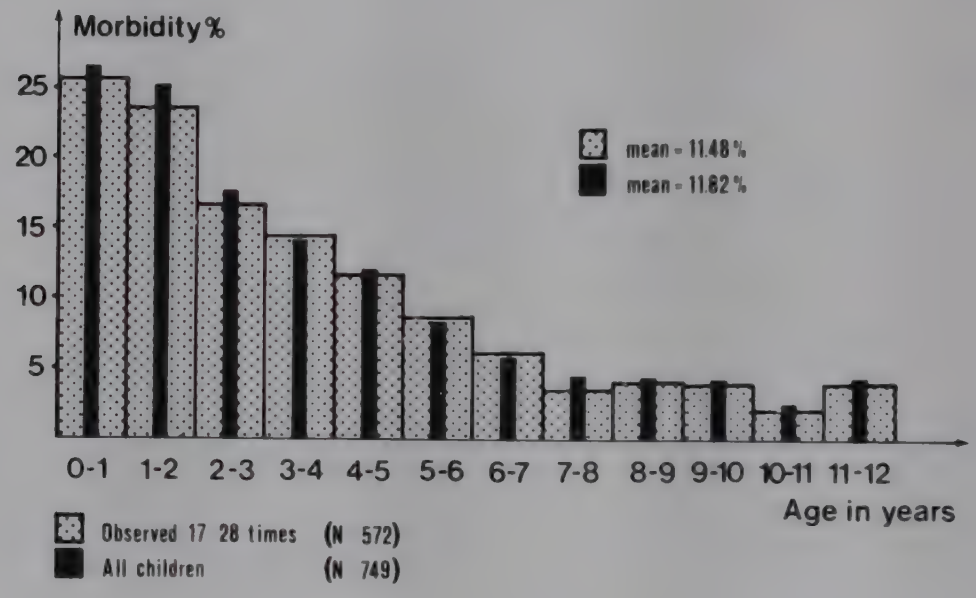

Figure 32. AVERAGE MORBIDITY in different age groups.

Figure 32 illustrates the average morbidity in different age groups for the whole home-visited group, weighed by the number of home-visits, and for the group followed by home-visits at least 17 times during the year. This group was shown to have maximum precision in the group measure of morbidity. It can be seen that the two distributions are quite similar. Only a slightly higher morbidity is observed in the age group 0-3 years, when early drop-outs are included. This may reflect the higher morbidity in children who died during the study. The morbidity observed in the group with incomplete information should, however, be assessed, taking into account possible seasonal variations in morbidity (95).

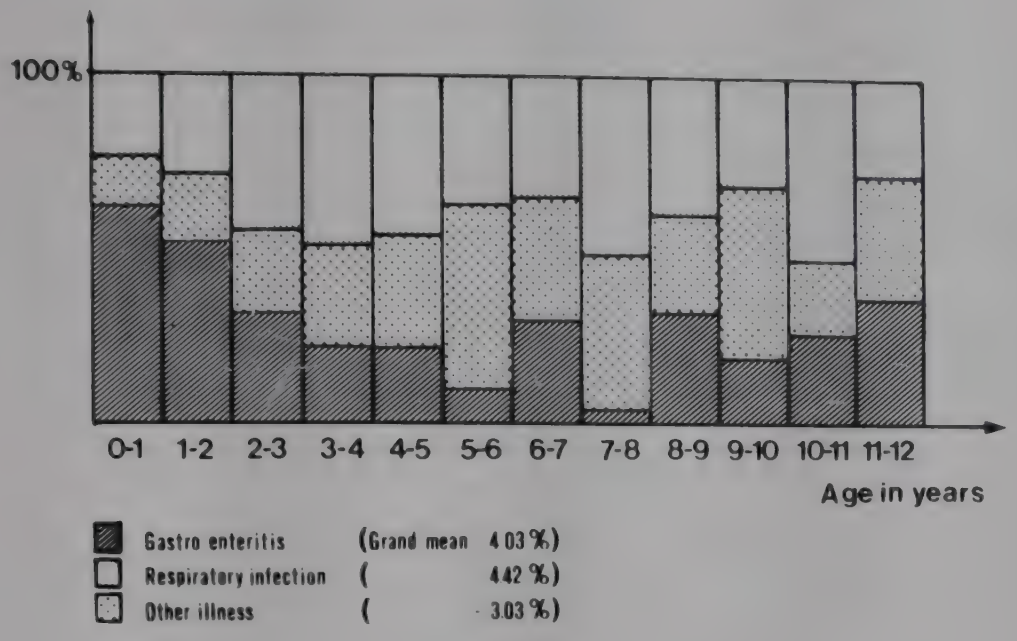

Figure 33 . Percentage distribution of SUB-CLASSIFICATIONS OF ILLNESS within each age group (N=572).

The proportion of enteric and respiratory infection and illness with other symptoms in different age groups is shown in Figure 33. Taking into consideration the high morbidity rates during the first years of life (Figure 32) it is quite clear that diarrhoeal and respiratory disease in early childhood is the major child health problem in the study area. It should be pointed out, however, that malnutrition - especially mild malnutrition - was generally not recognized by the mothers as illness.

5. MEASURING WEIGHT AND WEIGHT DEVELOPMENT

In this study weight for age is used as an expression for children´s nutritional status. As previously outlined, the intention is to discuss various determinants for nutritional development. The importance of morbidity for weight development is wellknown from the medical literature and is also illustrated by three cases from the longitudinal study as shown in Figure 34 . Morbidity measurements must logically be recorded before weight measurements in situations where morbidity is used to explain weight. This means that the weight observations from the

baseline study can be used in a dependant position only in relation to socio-environmental background factors.

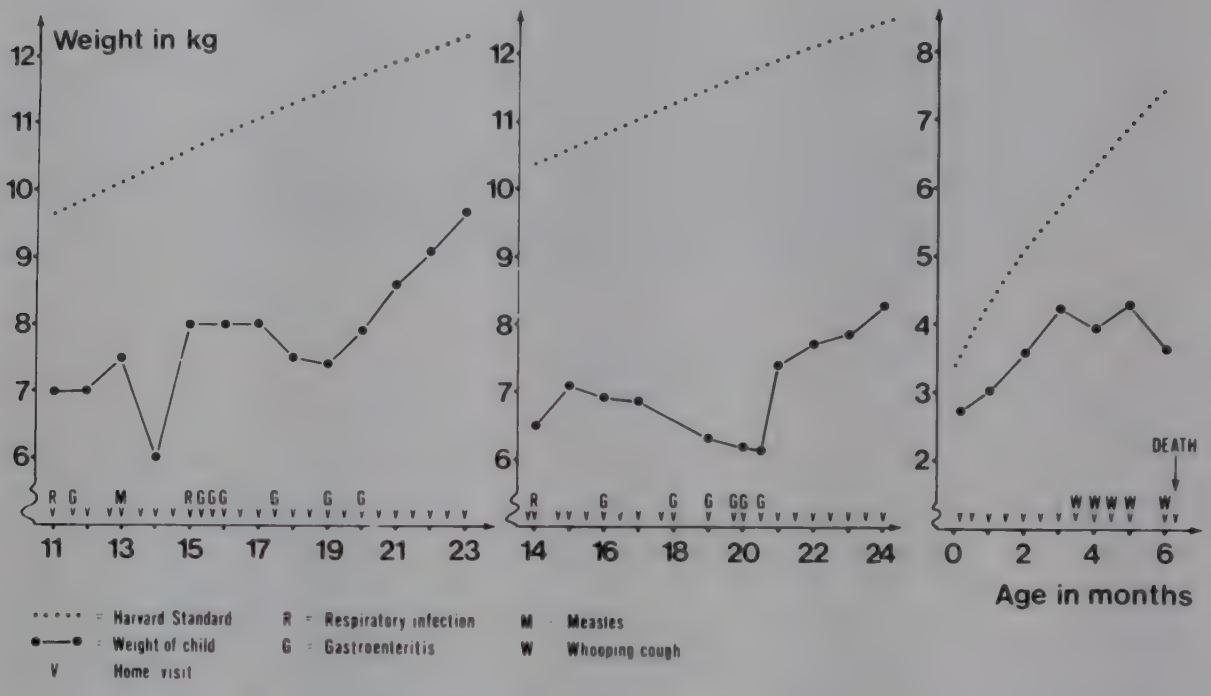

Figure 34. WEIGHT DEVELOPMENT of three children with frequent infections according to information obtained during home-visits.

As in the case of morbidity, weight was also recorded longitudinally at monthly intervals. This prospective design makes it possible to study the process of weight development in relation to preceding morbidity and socio-environment, which may be used in the prediction of growth.

Table 19. MEAN WEIGHTS in % of Harvard Standard at baseline 1972 and follow-up study 1973 for 234 children by age group in 1972

Age in months 1972	N	Mean weight in % of Harvard Standard		Standard deviation	
		1972	1973	1972	1973
0- 5	17	103.1	91.2	11.7	20.5
6-11	21	85.7	85.1	11.7	8.8
12-23	38	85.3	86.9	12.6	11.6
24-35	47	84.6	86.5	12.4	10.5
36-47	63	87.8	86.3	12.9	11.7
48-59	48	85.7	84.3	11.3	11.1

Baseline weight in 1972 and follow-up weights one year later are given in Table 19. It can be seen that newborns declined to a considerably lower nutritional standard already during the second half-year of life and that the average nutritional level does not change dramatically during the following years of life. This pattern confirms the observations made already in the baseline study (Figure 17). Two other publications will specifically deal with the study of weight and weight development (32,33).

6. NATALITY AND MORTALITY

During the longitudinal home-visit study and at the follow-up survey in 1973,62 births were registered (34 males and 27 females and one child without information about sex). Six of those newborns died during the year.

The large drop-out rate of households during the study year makes it impossible to give any reliable estimation of birth rate and infant mortality. However, in the 359 households (1917 individuals) for whom follow-up information was available for the whole year, 50 births had taken place (the remaining 12 newborns belonged to families that had left the home-visit study or were not available for the follow-up survey). This gives a crude birth rate among these households of 26 per 1,000 persons. The crude birth rate in Addis Ababa at large has been estimated at 43 % (9). Five of the 50 children died during the year, but as they were not observed more than on an average 6 months, the true infant mortality rate would be higher and of the same magnitude (170 per 1,000) as reported from Addis Ababa (9).

Of the 1,020 children registered at the base-line study in 1972, 671 belonged to households that were interviewed at the follow-up survey in 1973, when information about mortality was collected. This was, however, also done continuously during the home-visit study, which included another 78 children, who were observed for varying periods of time. The drop-out at different stages due to refusal and mobility makes the assessment of mortality very difficult. However, only 5 deaths were recorded in the above mentioned groups of children. Four of these children were under the age of 3 years at the

baseline survey (273 children were recorded in this age group at the baseline survey). Thus,the mortality rate among the pre-school children seems to be low compared to reports from other developing countries (72). However, if follow-up information had been available for all the initial households, the mortality figures would probably have been somewhat higher. The causes of death are given in Table 20 .

Table 20. AGE AT DEATH AND CAUSE OF DEATH in 11 children as based on information given by home visitors and interviewers at follow-up study.

Age at death	Cause of death
1 day	unknown
7 days	"
3 months	gastroenteritis
5 "	unknown
6 "	whooping cough
7 "	gastroenteritis
8 "	"
11"	"
29"	measles
47"	unknown febrile illness
7 years	sepsis (?) after infection in a foot

Information about morbidity rate was available for 47 of the 62 newborns from the home-visits. These children, who were all under the age of one year at the follow-up survey, had an average morbidity rate of 12.2 %, which is lower than in the youngest group of children followed from the baseline survey (Figure 32) - these children were 1-2 years old at the follow-up survey. It should, however be observed that the calculation of morbidity rate in the newborns was based on an average observation period of only 6 months.

Longitudinal morbidity information was also available for the 5 older children that died. Their average morbidity rate was 35 %, but it should be observed that they had been observed on an average only 5 times. The morbidity among these children would because of their low number, have only a marginal influence on the morbidity figures as discussed in section 4 for the whole group of children with incomplete morbidity information.

7. MEASURING CHANGE IN KNOWLEDGE.

As part of the study of socio-environmental determinants for the utilization of the MCH clinic by mothers and children, a special study was conducted to measure mothers´ knowledge about vaccinations and if any changes during the year 1972-73 could be related to the clinic´s health education program.

In a panel study, about 150 mothers were asked if they knew any means of preventing their child from getting the locally well-known diseases of tuberculosis, smallpox, whooping cough and tetanus in order to explore their knowledge about vaccinations before and one year after the establishment of the clinic.

Ordinarily there is no problem in applying conventional statistical techniques for the estimation of change to such data. Since vaccination is a widely spread concept it is, however, close at hand to suspect that a "correct" answer is given without the actual knowledge, i.e. by guessing. In a separate report, (93) a statistical model is derived where this risk is taken account of. It is shown that the initial knowledge as well as the change in knowledge could be estimated by unbiased and efficient estimators if the guess-rate is predermined, e.g. by using a multiple-choice design.

Table 21. An illustration of the effects when guessing is not corrected for on estimates of proportion of initial knowers ($\hat{P}_B$) and the proportion that changed from lack of knowledge to knowledge ($\widehat{P_A - P_B}$). (Tetanus has been exlcuded since there was obviously no knowledge about this vaccination).

Disease	Guessrate(p)	$\hat{P}_B$	$\widehat{P_A - P_B}$
Tuberculosis	0	0.34	0.10
	0.1	0.26	0.11
	0.2	0.15	0.12
Smallpox	0	0.54	0.06
	0.1	0.49	0.07
	0.2	0.43	0.08
Whooping cough	0	0.28	0.25
	0.1	0.19	0.27
	0.2	0.09	0.31

The effects of not accounting for unreliable responses could be illustrated using empirical data. Table 21 shows that the larger the tendency for guessing (p), the more one overestimates the initial and underestimates the change in knowledge if guessing is not corrected for.

8. MEASURING UTILIZATION OF THE CLINIC

The clinical notes made in child health charts, that were kept in the homes by the mothers, made it possible to collect objective community data about utilization of the clinic. This opportunity was made use of at the follow-up survey in 1973 as well as in the 1975 retrospective 3-year study.

In principle the study of utilization may be regarded in terms of evaluative research. Thus continuous information obtained from the clinic itself and from the community would form a basis for continuous evaluation and feed-back into the health service system. During the first year of the clinic´s actvities internal statistics were used to adjust the organization to the load of patients. The following is a brief account of the utilization of the clinic as measured in the community.

The community study of utilization can be described as a combination of a panel study of short duration and a later retrospective study (Figure 35). This offers both the advantage of using extensive baseline and health incidence data obtained during the one-year home-visit study of households, that stayed in the area during this period, and the advantage of obtaining information about utilization over a longer period of time for both the stable and the mobile part of the population.

For the one-year panel study, a group of 157 households were selected according to the following criteria: the mother was the respondant to questions about visits to the clinic at the follow-up survey in 1973 and the household had been followed by home-visits for the whole year; 426 children in these households fullfilled the same criteria.

Since data were collected for households *and* children several approaches are possible in the measurement of utilization. We consider utilization a family decision manifested by the mother, who according to experience at the clinic was the one who brought the children there. One approach would be to

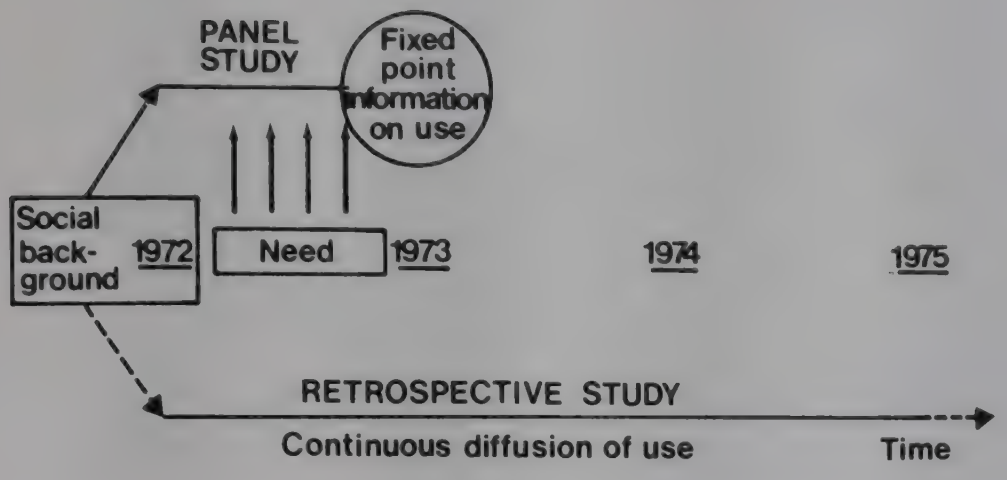

Figure 35. A model of the two branches of the study of utilization.

characterize those households where the mother had used the clinic as compared to those who had not. We call this a *qualitative use-nonuse behaviour*. The individual approach, on the other hand, permits, in addition, an interpretation of the mother´s perception of the child´s need. For a confirmation of utilization behaviour to take place, the initial visit must be followed by subsequent visits, e.g. *quantity in use*.

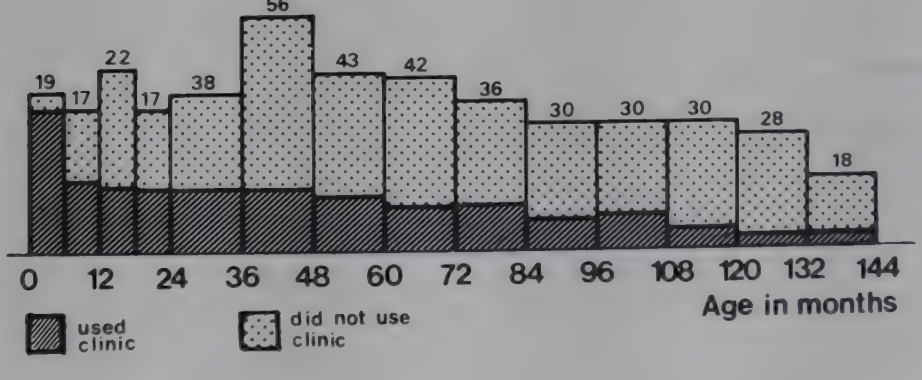

Figure 36. AGE DISTRIBUTION AND QUALITATIVE USE among 426 children. (Shaded areas indicate the proportions of children within each age group that have used the clinic 1972-1973. Figures on bars denote the number of children.

Analysis of the data showed that about half of the mothers and a third of the children used the clinic once or more during the first year. It is evident that utilization is strongly related to children´s age as reported at the baseline survey in 1972 (Figure 36). Wide variations could also be demonstrated when utilization was measured as the number of clinic visits per child (Figure 37).

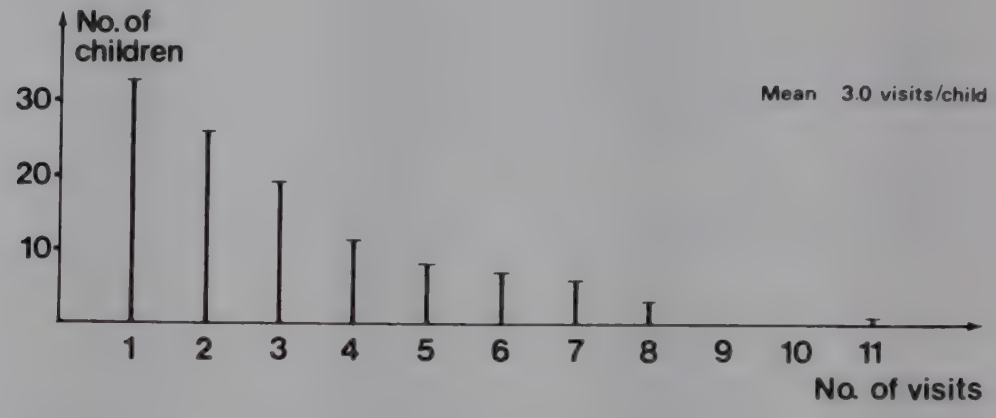

Figure 37. Frequency distribution of NUMBER OF CLINIC VISITS among 114 children with information about visit rate 1972 - 1973

The main objectives of the analysis of the results from the one-year prospective study are to define target groups with inadequate use and to explore different kinds and levels of interaction between socio-environmental and need factors on utilization. These components will then be discussed in terms of a model for utilization behaviour (94,27).

As the MCH clinic was introduced in a community lacking previous local medical facilities, it can be classified as an *innovation*. This offers the opportunity of widening the scope of the analysis of utilization by applying theories and methods already established in various fields of innovation research (80). The retrospective part of the study, therefore, focuses on the diffusion process of utilization during the three years after the establishment of the clinic. The 1975 sample, consisting of 595 households with at least one child under the age of 12 years, was drawn from three, geographically distinct areas, one area in the immediate neighbourhood of the clinic (area II) and two surrounding areas located at about the same distance from

the clinic. Area I, furthermore, coincides with the study area of the one-year panel study.

The child health charts served as sources of community utilization data for the period 1972-1973. They proved to be very efficient in this respect, since not more than 10 % of the charts were lost and another 3 % unavailable for other reasons. Subtracting another 6 % of the charts, that were incompletely filled in, 477 households with 1,053 children could be studied retrospectively as regards their use of the clinic since its start in 1972.

This retrospective study, as distinguished from the panel study, offers the opportunity to study utilization not only for the residential but also for some part of of the mobile population, that one moving into the area. This, however, raises methodological problems: It is evident that the latter had shorter exposure to the clinic and consequently less chance of using it within a certain time period. The same reasoning applies to children who were born after the opening of the clinic.

Measures of innovation-decisions,aggregated continuously over time, are often used in the analysis of temporal diffusion. This is commonly illustrated by means of cumulative and non-cumulative diffusion curves, where the x-axis represents time of exposure to the innovation and the y-axis percent of adopters of the innovation. The curves make it possible, in each point of time, to compare the diffusion of an innovation for relevant groups.

Some initial results from this study are shown in Figures 38 and 39. An "area effect" is displayed in Figure 38. The diffusion curve in area II, located closest to the clinic, grows most rapidly. Thus, more than 1/3 of the families in the immediate catchment area spontaneously used the clinic during the first six months of being exposed to it. The intersection between

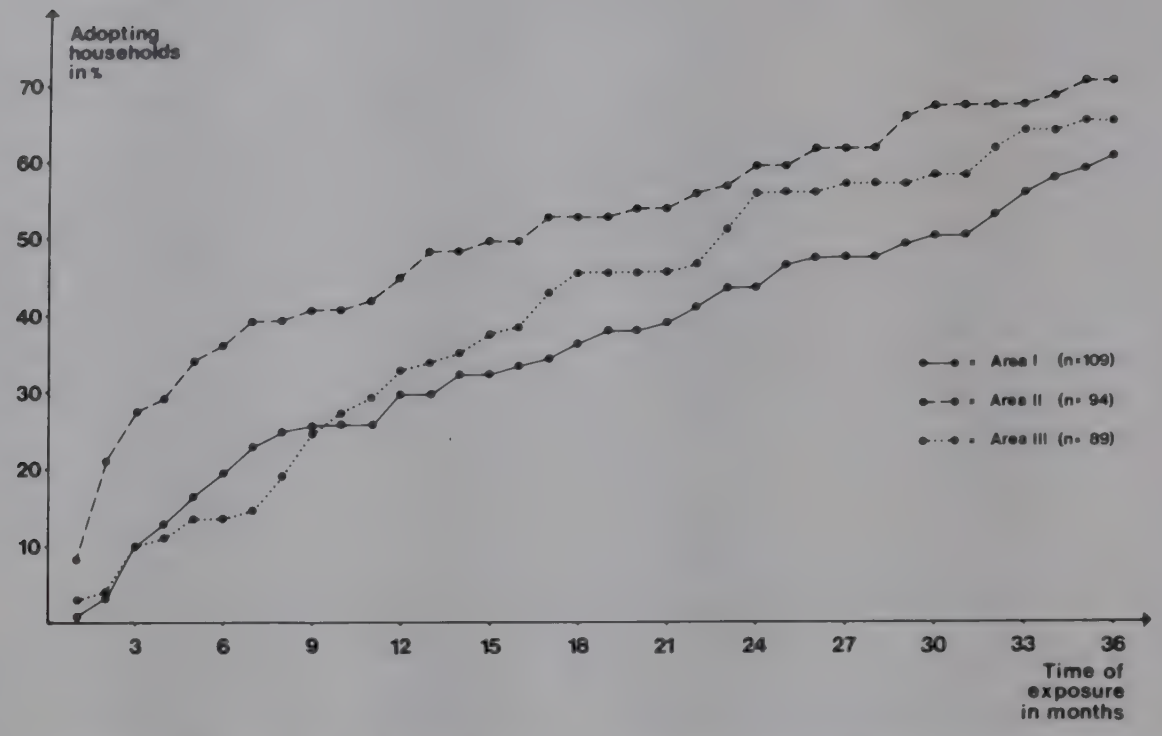

Figure 38. UTILIZATION OF THE CLINIC 1972-1973. Cumulative diffusion curves by residential area for households that lived in the Kirkos area for the whole study period. (Adopting households = households that used the clinic at least once)

the two curves for area I and III may indicate an initial "home-visit effect" in area I caused by those households that were visited every two weeks in 1972-1973. Actually, 9 months after the start of the clinic they constituted 61 % of the adopters but only 35 % of the sample.

Figure 39 shows that newborns and infants, two of the main target groups of the clinic, had utilized the clinic to a considerable extent. Furthermore, with only limited activities to inform the community, about 60 % of the families that got their first child during the study period were reached within the child´s first year of life. This was confirmed by the findings in the one year study, indicating high usage among infants with a mean number of four visits during the year, the minimum number of clinic contacts to provide infants with basic care and vaccinations (68).

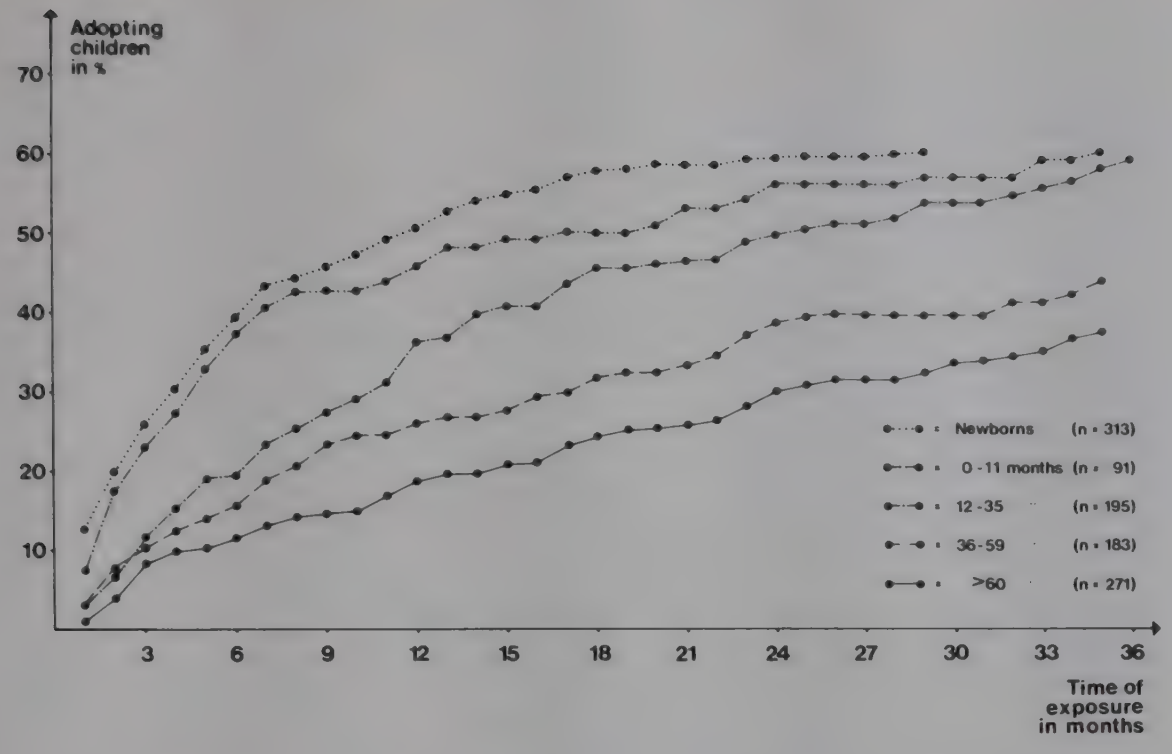

Figure 39. UTILIZATION OF THE CLINIC 1972-1975. Cumulative diffusion curves for different age groups of children. (Age recorded when child first had the possibility of visiting the clinic. Adopting children = children that used clinic)

The above results are only preliminary illustrations of the methodology, which will be subject to further application focusing not only on adoption but also on confirmation behaviour. Socio-economic background information will also, to a certain extent, be used in the further analysis (94) in the attempt to characterize high and low consumers as well as early and late adopters of health services. Mathematical functions fitted to the cumulative diffusions curves may then be useful for the construction of models for predictive purposes and adjustments of action programs towards optimum levels of health services utilization. The evaluation of health services presents the problem of measuring a continuous process in time. The feasibility of using the Child Health Chart to obtain objective community information for this purpose is well documented as it was the source of information in both branches of this study.

CHAPTER 6

CONCLUSIONS AND PERSPECTIVES

1. INTRODUCTION

The Kirkos study was aimed at the study of community child health and its determinants in a developing country. In the previous chapters the formation of a multidisciplinary research team from local institutions, the process of problem identification, the collection of data and the initial phases of data analysis have been described. That presentation also includes a basic discussion about the research approach, which has been defined as an exploratory process aiming at the generation of hypotheses, which could be evaluated in practical action programs. This chapter summarizes some experiences gained during the course of the study and points out some of the practical results of the initial data analysis and their immediate implications. It concludes by identifying areas and directions of the further analysis of the data in accordance with the research model and the conceptual model for child health outlined in chapter 2.

2. SOME PRACTICAL RESULTS AND THEIR IMPLICATIONS

This project presents an attempt to engage the limited resources in terms of staff and economy from several local institutions in the formation of a multidisciplinary research team. These institutions had so far been working independently and their successful cooperation in this study is indicative of the feasibility of multidisciplinary development research based on local resources.

The readiness of local authorities to cooperate in medical research, that was not exclusively service oriented, was demonstrated many times during the course of the study. Of special interest was that the local voluntary economic associations - the Edder groups (43) - could be reached by health education, indicating the possibility of using them as communication channels and change agents (37) for child health. Other potential local change agents were the schools. The teachers in the community schools assisted the clinic´s staff in organizing a well received nutrition and health education program for children of all grades. The possibility of community participation in child health services was shown by the fact that a local housewife without any previous medical training could be employed as an auxiliary at the clinic and as a home-visitor in a program designed to rehabilitate malnourished children in their homes.

Suspiciousness is a common problem obstacle to community research in all developing countries (69). This was also encountered in this study even if it did not constitute a major problem. The collection of community data was performed by nonmedical interviewers, who were instructed not to interfere in medical and health matters. They could, however, refer to the small MCH clinic that was part of the project, when asked for medical advice or treatment by the mothers. This principle of avoiding active interference gave rise to some debate as it was felt by some of the participants that the recording of ill-health also means the moral obligation of treating it. These doubts did not, however, seem to be shared by the community people, who were satisfied with the introduction of a free MCH clinic in the area. Longitudinal observations are indispensible in community studies of childhood morbidity and nutritional development. Such studies are time and staff consuming and their outcome will depend on the cooperation of the families involved. It was therefore encouraging to experience the acceptance by the mothers of the home-visitors every second week during one year, asking questions about children´s health and weighing them, procedures the significance of which may not have been immediately obvious to them. The collection of blood-samples, however, gave rise to some refusals in spite of the good relations that had been established between interviewers and families. This illustrates that it is important not to challenge traditional health beliefs during the course of community studies. Better management could not, however, have controlled the main cause of "drop out" in this study, being due to the great mobility rate among the population.

One methodological problem observed in this study, was raised by the lack of registers, a common problem in developing countries. This has the consequence that easily available sampling frames are lacking. In this study a sampling frame could be created by the use of an air photo of the area in which the smallest identifiable units were the houses. This created the problem of taking into account the correlations with regard to child characteristics within the households, an intra-cluster correlation. This problem, often neglected in surveys from developing countries, will be discussed and possible solutions applied in other publications (27,94).

The experiences from the simple MCH clinic that was part of the project indicated that it is possible to deliver basic child health services to great numbers of children at low costs. The basis for this was delegation of tasks,

conventionally carried out by a doctor to a nurse or a dresser, and of other less qualified medical tasks such as weighing children, administration of drugs and treatments as well as simple health education and nutrition rehabilitation to auxiliaries. This could be done with very modest equipment in terms of buildings and furniture and with an efficient arrangement for the flow of patients. The addition of this kind of simple MCH clinics as satellites to already existing MCH centres in a city like Addis Ababa would probably be an economically feasible way of achieving complete coverage with accessible MCH services, especially as they could probably be initiated and also financed by the various communities themselves.

The Child Health Chart, introduced in Ethiopia by this project, was shown to be a very useful tool in the diagnosis of early malnutrition and ill-health. Kept at home by the mothers it was brought to the clinic at each child visit with surprising regularity, a time saving and more reliable system of record keeping than clinic filing. This chart was also shown to be a useful tool for community health surveys. It was used successfully as an objective source of information in surveys of community utilization of child health services. Other clinical information available on these chards add to its value in child health surveys in the community.

In community studies in a developing country it is essential that data are fed back without delay to participating institutions and made known to administration and people responsible for planning. The participation in this project of expatriates, finishing their terms of service in the country before the initial data compilation was completed, led to a delay in the extraction of data. It also meant, however, that computer programs not available locally could be utilized in the later analysis. The fact that all primary data were kept and coded locally and that contacts could be maintained by correspondance and by visits, illustrates that research cooperation over great geographical distances is possible if there is a mutual determination to undertake the effort.

3. DIRECTIONS OF FURTHER ANALYSIS

The Kirkos study provides community data about child health and its background of socio-environmental conditions as well as information about performance and utilization of a small MCH clinic, that was introduced as an innovation in the study area. The aim, implicit in the study from its outset, was to initiate an evaluative research process, in which information from these different areas could be used to define and continuously evaluate programs for child health in the community.

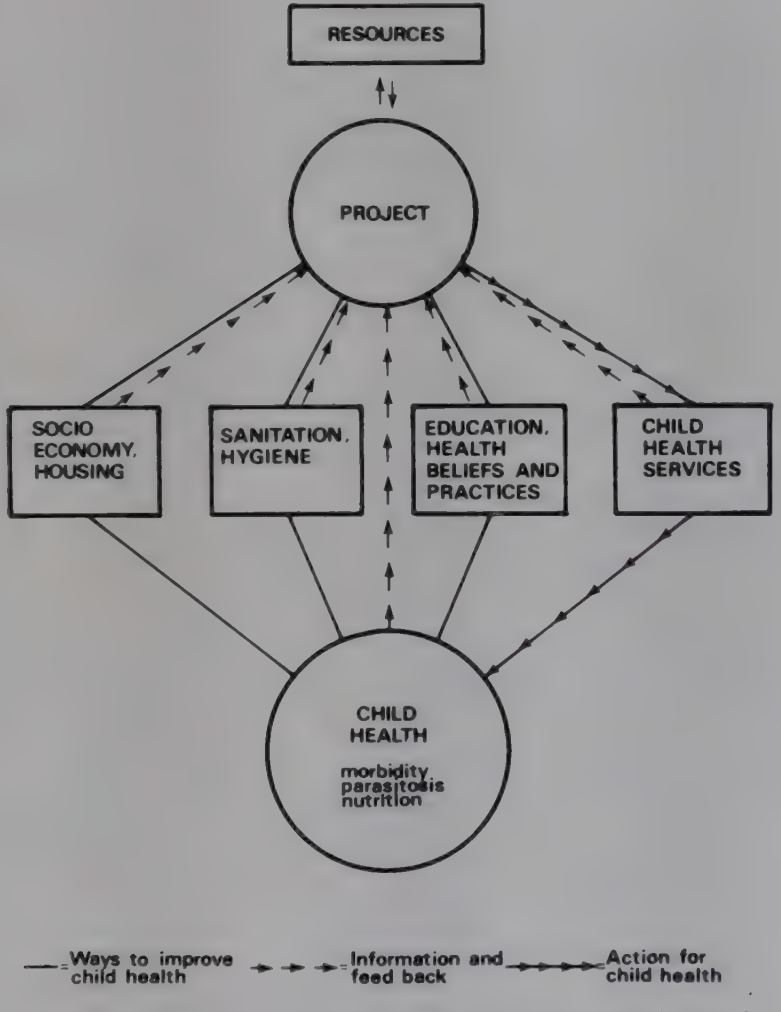

Figure 40. The flow of information and action in the Kirkos study.

The scope of the project was, however, limited of various practical reasons. The factual frames of the project are given in the previous account of the project´s components and of the data collected. Figure 40 illustrates the fields from which information was obtained in the Kirkos study. Figure 41

summarizes the measures that are available for the further analysis. The main part of the project was concentrated to one year and gave baseline information on socio-environmental conditions and health incidence data obtained during fortnightly homevisits. During this period the small MCH clinic was also studied with regard to its performance, based on clinical statistics, and with regard to its utilization by the households included in the original sample. Utilization data were also obtained for a three year period from another sample of households from the same general population.

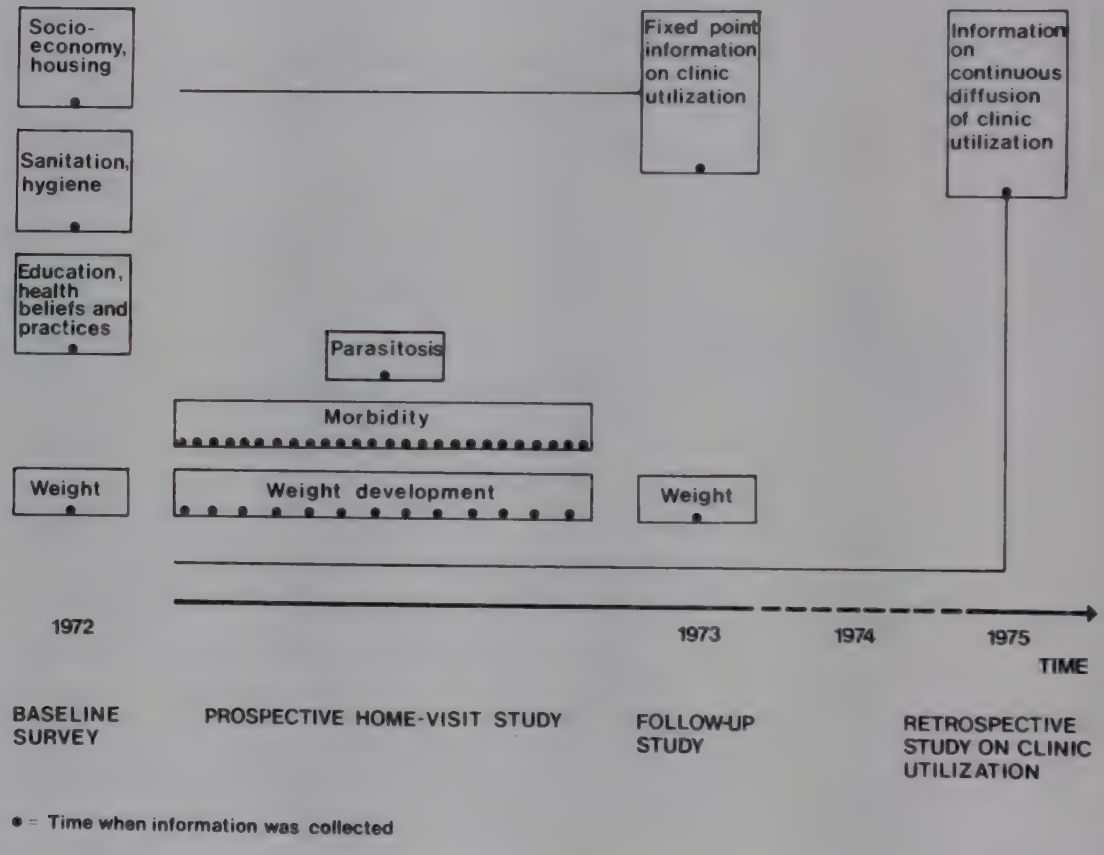

Figure 41. An overview of variables measured in the Kirkos study.

The health service sector was the only field in which action to promote child health was taken in the Kirkos study, which then could be seen as the initial and exploratory stage of a comprehensive evaluative study of child health. The frame given by the data at this stage would allow two main directions of analysis:

- The investigation of socio-environmental determinants for child health as measured by weight, morbidity and parasitic infection.

- The investigation socio-environmental determinants for community utilization of MCH-services.

The conceptual model proposed in chapter 2 includes both these aspects. The main criterion variable is naturally child health but the model will also allow measures of child health services utilization to be analysed as criterion variables.

The difficulties in choosing relevant expressions for various components in an ecological model of child health as well as the problems encountered in the identification and measurement of variables, have been discussed in the previous chapters of this publication. The approach used was based partly on local experience and partly on the medical literature. The incomplete knowledge about the interplay of socio-environmental, medical and health service factors necessitated an exploratory research design, with the aim of forming a basis for the creation of sound hypotheses in evaluative child health programs.

Cross tabulations between measures of child health and measures of socio-environmental factors show that malnutrition and high morbidity rates are associated with low income, illiteracy, low standard of housing, low water consumption, low latrine standard etc. (see Appendix). The registration of these bivariate associations would, however, add only limited knowledge about the complicated interactions between all these factors and about their relative importance for child health. In the further analysis of different sets of data obtained in the Kirkos study (Figure 41) it is therefore necessary to develop and employ multivariate statistical approaches which can give a simultaneous interpretation of the interaction patterns between the variables. The following are some of the specific problems to be dealt with in the further analysis of data:

- Weight of children, measured at the baseline survey

  What are the important determinants among socio-environmental factors like income, mother´s education, ethnicity, latrine standard, housing standard, water consumption etc.?

• Weight of children measured at the follow-up survey after one year.	What additional "explanation" of variation in weight can be obtained by taking preceding morbidity into account?
• Weight development of children	How can a measure of nutritional development based on monthly weight recordings by created? How can this measure be studied in relation to a longitudinal measure of morbidity? What among the socio-environmental conditions and individual factors such as age, sex and morbidity, would be important as determinants of weight development?
• Morbidity	How can a reliable measure of morbidity based on fortnightly observations during one year be created? What would be important determinants for morbidity among socio-environmental conditions and individual child variables such as age, sex and weight before the recording of morbidity?
• Parasitic infection	What would be an adequate measure of parasitic load? What among socio-environmental and individual factors would "explain" variations in this measure?
• Utilization of the MCH clinic 1972-73	What would be an adequate aggregated measure of household and individual utilization of the clinic? What are the relatively most important explanatory factors for variations in this measure among household factors and individual characteristics?
• Utilization of the MCH clinic 1972-75	What would be a useful measure of utilization behaviour over a longer period of time? What would determine variations in this measure?

The feasability of using a multivariate approach in the analysis of the data in this study in order to generate hypotheses of relevance for the practical planning of child health programs is illustrated by some preliminary results (27,35). Low water consumption and low latrine standard thus seems to be more strongly related to childhood morbidity than any other environmental or social factors. Such results could be taken as the basis for the hypothesis that the provision of water and good latrines would be effective means of promoting child health. This could then be tested in practical child health programs. In the same way mother´s education seem to be related to utilization of the MCH clinic, a finding that also has practical implications.

These and other relationships will be studied more in detail in the further analysis of the data material provided by the Kirkos study. The results will hopefully contribute with information of relevance for the planning of action programs for child health in Ethiopia as well as in other developing countries.

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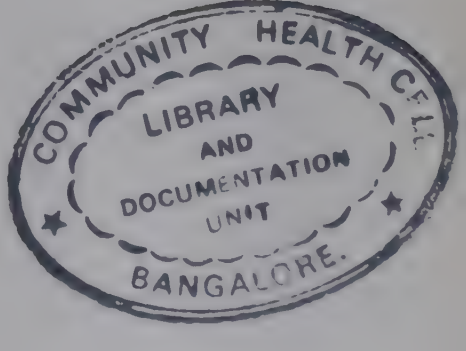

TABLE A1: QUALITY OF HOUSING

		No. of households	%
Foundation of house	Wood	191	32.0
	Stone	343	57.7
	Concrete	40	6.7
	Not stated	26	3.6
	Total	600	100.0
Floors	Bare ground	218	36.5
	Wood	279	46.5
	Cement, tiles, stone	80	14.7
	Not stated	23	2.3
	Total	600	100.0
Walls	Wood + chika	510	85.0
	Wood only	16	2.7
	Stone + chika	24	4.0
	Stone only	6	1.0
	Bricks or cement blocks	11	1.8
	Corrugated iron	8	1.3
	Not stated	25	4.2
	Total	600	100.0
Ceiling	No ceiling	272	45.3
	Cloth	285	47.5
	Mats	9	1.5
	Wooden boards	10	1.7
	Not stated	24	4.0
	Total	600	100.0
Roofs	Corrugated iron	575	95.8
	Other	2	0.3
	Not stated	23	3.8
	Total	600	99.9
Windows	No windows	68	11.7
	Windows with shutters only	326	54.3
	Windows with glass panes and shutters	174	29.3
	Not stated	32	4.7
	Total	600	100.0
Lighting	Electricity	554	92.3
	Kerosene lamps	16	2.7
	Not stated	30	5.0
	Total	600	100.0

TABLE A2: LIVING AREA PER HOUSEHOLD MEMBER

Living area in m^2 / household member	No. of households	%
0.0 - 2.4	40	6.7
2.5 - 4.9	168	28.0
5.0 - 7.4	121	20.2
7.5 - 9.9	73	12.2
10.0 - 14.9	54	9.0
15.0 - 19.9	16	2.7
20.0 - 24.9	7	1.2
25.0 - 29.9	3	0.5
30.0 -	3	0.5
Not stated	115	19.2
Total	600	100.2

TABLE A3: HOUSING TENURE AND HOUSERENT

Title of Holding	No. of households	%
Own house (house and/or land, lease)	142	23.7
Rented house: - 9 Eth. $/month	44	7.3
10-29	249	41.5
30-49	87	14.5
50-	35	5.8
Cost not stated	7	1.2
Other arrangements (offered free of charge by relatives or employer)	31	5.2
Not stated	5	0.8
Total	600	100.0

TABLE A4: REFUSE DISPOSAL

	No. of households	%
Refuse collected regularly by Municipality Services	236	39.3
Non scheduled collected by Municipal Services	173	28.8
Dumping in the open outside house or in streams	165	27.5
Burning or burying of refuse	5	0.8
No information	21	3.5
Total	600	99.9

TABLE A5: LATRINE STANDARD

Latrine standard	No. of households	%
Water flush toilet	28	4.7
Private pit latrine	65	10.8
Shared pit latrine	423	70.5
Public pit latrine	56	9.3
Open field	5	0.8
No information	23	3.8
Total	600	99.9

TABLE A6: SOURCE OF WATER

Source of water	No. of households	%
Private tap	62	10.3
Shared tap	341	56.8
Buying from neighbours	38	6.3
Community standpipe	136	22.7
Well	1	0.2
No information	22	3.7
Total	600	100.0

TABLE A7: WATER CONSUMPTION/HOUSEHOLD MEMBER/DAY

Water consumption litres/household member/day	No. of households	%
0.0 - 2.4	6	1.0
2.5 - 4.9	52	8.7
5.0 - 7.4	95	15.8
7.5 - 9.9	77	12.8
10.0 - 14.9	88	14.7
15.0 - 19.9	67	11.2
20.0 - 29.9	56	9.3
30.0 - 49.9	36	6.0
50.0 -	18	3.0
No information	105	17.5
Total	600	100.0

TABLE A8: AGE AND SEX DISTRIBUTION OF THE KIRKOS SAMPLE

Age in years	Males		Females		Males+Females		Cumulative distribution	
	N	%	N	%	N	%	N	%
0 - 4	252	8.6	224	7.7	476	16.3	476	16.3
5 - 9	199	6.8	214	7.3	413	14.1	889	30.4
10 - 14	155	5.3	202	6.9	357	12.2	1246	42.6
15 - 19	171	5.8	194	6.6	365	12.4	1611	55.0
20 - 24	105	3.6	146	5.0	251	8.6	1862	63.6
25 - 29	97	3.3	146	5.0	243	8.3	2105	71.9
30 - 34	101	3.5	82	2.8	183	6.3	2288	78.2
35 - 39	72	2.5	77	2.6	149	5.1	2437	83.3
40 - 44	53	1.8	61	2.1	114	3.9	2551	87.2
45 - 49	38	1.3	35	1.2	73	2.5	2624	89.7
50 - 54	32	1.1	34	1.2	66	2.3	2690	92.0
55 - 59	22	0.8	10	0.3	32	1.1	2722	93.1
60 - 64	18	0.6	15	0.5	33	1.1	2755	94.2
65 -	18	0.6	15	0.5	33	1.1	2788	95.3
Adult age not stated	89	3.0	49	1.7	138	4.7	2926	100.0

TABLE A9: AGE DISTRIBUTION. Ethiopia 1971, Addis Ababa 1967 and Kirkos 1972

Age in years	Ethiopia 1971*)			Addis Ababa 1967*)	Kirkos 1972
	Total	Rural	Urban		
0 - 4	18.4	18.8	15.1	15.7	16.3
5 - 9	14.6	14.8	13.0	13.0	14.1
10 - 14	12.3	12.4	11.0	10.9	12.2
15 - 19	10.4	10.4	9.6	10.3	12.4
20 - 24	8.7	8.7	7.9	8.6	8.6
25 - 29	7.5	7.4	9.2	9.8	8.3
30 - 34	6.4	6.2	8.5	8.6	6.3
35 - 39	5.3	5.1	7.2	7.2	5.1
40 - 44	4.4	4.2	5.7	5.2	3.9
45 - 49	3.4	3.4	3.7	3.2	2.5
50 - 54	2.7	2.6	3.3	3.0	2.3
55 - 59	2.0	2.1	1.7	1.4	1.1
60 -	3.9	3.9	4.1	3.3	2.2
no inf. (adults)					4.7
Total	100.0	100.0	100.0	100.2	100.0

*) Source: Statistical Abstract, 1971 and Population of Addis Ababa 1972, Central Statistical Office, Addis Ababa.

TABLE A10: SEX RATIO (MALE/FEMALE) BY AGE GROUP IN ETHIOPIA, ADDIS ABABA AND KIRKOS SEFER

Age in years	Ethiopia 1971 *			Addis Ababa 1967 *	Kirkos sample 1972
	Total	Rural	Urban		
0 - 4	102.8	102.1	110.6	103.2	112.5
5 - 9	100.6	100.2	104.9	97.1	93.0
10 - 14	101.3	101.0	103.9	95.8	76.7
15 - 19	97.9	99.5	82.0	80.9	88.1
20 - 24	97.9	100.9	71.7	82.8	71.9
25 - 29	100.7	105.9	69.0	79.6	66.4
30 - 34	103.2	106.1	85.4	105.2	123.2
35 - 39	103.4	104.4	97.0	108.0	93.5
40 - 44	104.7	104.3	107.6	128.8	86.9
45 - 49	109.2	107.5	125.0	133.6	108.6
50 - 54	107.8	108.4	104.0	103.3	94.1
55 - 59	115.6	114.7	125.9	120.8	220.0
60 -	150.2	158.4	97.0	97.0	120.0
Adult age not stated					181.6
Total	103.4	104.4	95.0	97.4	94.5

*Source: Statistical Abstract 1971 and Population survey of Addis Ababa, 1967.

TABLE A11: AGE AND SEX DISTRIBUTION OF CHILDREN UNDER THE AGE OF 12 YEARS IN THE KIRKOS SAMPLE OF 2926 INDIVIDUALS

Age in months	Males	Females	Males + females	% of Kirkos sample
5	25	10	35	1.2
6-11	25	21	46	1.6
12-23	48	39	87	3.0
24-35	49	56	105	3.6
36-47	56	52	108	3.7
48-59	49	46	95	3.2
60-71	43	45	88	3.0
72-83	41	45	86	2.9
84-95	41	50	91	3.1
96-107	39	40	79	2.7
108-119	35	34	69	2.4
120-131	35	42	77	2.6
132-143	28	26	54	1.8
Total	514	506	1020	34.8

TABLE A12: HOUSEHOLD SIZE

No. of household members	No. of households	%
1	34	5.7
2	82	13.7
3	105	17.5
4	92	15.3
5	84	14.0
6	58	9.7
7	47	7.8
8	28	4.7
9	23	3.8
10	24	4.0
11	10	1.7
12	6	1.0
13	3	0.5
14	4	0.7
Total	600	100.1

TABLE A13: NO. OF CHILDREN UNDER THE AGE OF 12 YEARS PER HOUSEHOLD

No. of children per household	No. of households	%
0	189	31.5
1	125	20.8
2	110	18.3
3	79	13.2
4	61	10.2
5	25	4.2
6	8	1.3
7	3	0.5
Total	600	100.0

TABLE A14: MONTHLY HOUSEHOLD INCOME

Monthly income in Eth. $	No. of households	%
- 49	181	30.2
50 - 99	125	20.8
100 - 299	163	27.2
300 - 499	46	7.7
500 -	35	5.8
Not stated	50	8.3
Total	600	100.0

TABLE A15: HOUSEHOLD INCOME BY NUMBER OF HOUSEHOLD MEMBERS
(Percentage distribution)

No. of household members	Monthly income in Eth. $						Total
	- 49 (N=181)	50-99 (N=125)	100-299 (N=163)	300-499 (N=46)	500 - (N=35)	Not stated (N=50)	(N=600)
1 - 2	37.0	16.0	9.8	10.9	2.9	14.0	19.4
3 - 5	48.6	51.2	49.1	28.3	28.6	52.0	46.8
6 -	14.4	32.8	41.1	60.9	68.6	34.0	33.8
Total	100.0	100.0	100.0	100.1	100.1	100.0	100.0
Average no. of members/ household	3.5	4.9	5.3	6.3	8.0	5.3	4.9

TABLE A16: MARITAL STATUS OF HEADS OF HOUSEHOLD

Marital status	Males		Females	
	N	%	N	%
Single	37	7.6	3	2.7
Married	434	88.8	0	0.0
Divorced	5	1.0	47	42.3
Widowed	4	0.8	44	39.6
Separated	2	0.4	13	11.7
Not stated	7	1.4	4	3.6
Total	489	100.0	111	99.9

TABLE A17: RELIGION OF HEADS OF HOUSEHOLD

Religion	No. of households	%
Ethiopian Orthodox Christian	515	85.8
Moslem	50	8.3
Other religion	34	5.7
Not stated	1	0.2
Total	600	100.0

TABLE A18: ETHNIC GROUP OF HEADS OF HOUSEHOLD

Ethnicity	No of households	%
Tigre	217	36.2
Amhara	193	32.2
Oromo (Galla)	73	12.2
Gurage	31	5.2
Other	30	5.0
Not stated	56	9.3
Total	600	100.1

TABLE A19: EDUCATIONAL STATUS OF MARRIED COUPLES IN 600 HOUSEHOLDS

Educational status	Males		Females	
	N	%	N	%
Can neither read nor write	126	29.0	328	75.6
Reading only (no school education)	13	3.0	6	1.4
Reading and writing (no school educ.)	149	34.3	35	8.1
Primary school	55	12.7	41	9.4
Secondary school	68	15.7	20	4.6
Higher education	9	2.0	0	0.0
Not stated	14	3.2	4	0.9
Total	434	99.9	434	100.0

TABLE A20: EDUCATIONAL STATUS OF HEADS OF HOUSEHOLDS

Educational status	Males		Females	
	N	%	N	%
Can neither read nor write	137	28.0	97	87.4
Reading only (no school education)	14	2.9	1	0.9
Reading and writing (no school educ.)	158	32.3	5	4.5
Primary school	62	12.7	5	4.5
Secondary school	92	18.8	2	1.8
Higher education	12	2.5	1	0.9
Not stated	14	2.9	0	0.0
Total	489	100.1	111	100.0

TABLE A21: ETHNIC GROUP OF RESPONDANTS BY PROVINCE OF BIRTH

Province of birth	Ethnic group					Total
	Tigre	Amhara	Oromo	Gurage	Other	
Addis Ababa	4	33	11	4	3	55
Shoa (outside Addis Ababa)	4	127	63	30	8	232
Eritrea	150	0	0	0	1	151
Tigre	70	0	0	0	0	70
Hararge	0	19	1	1	10	31
Wollo	1	23	0	0	0	24
Arussi	0	5	3	0	0	8
Wollega	0	0	7	0	0	7
Sidamo	0	0	0	1	4	5
Begemdir	0	4	0	0	0	4
Kaffa	0	3	0	0	1	4
Gojam	0	3	0	0	0	3
Illubabor	0	1	0	0	0	1
Gemu Gofa	0	0	0	0	1	1
Outside Ethiopia	0	0	0	0	1	1
Not stated	0	2	1	0	0	3
Total	229	220	86	36	29	600

TABLE A22: DURATION OF RESIDENCE IN ADDIS ABABA BY PROVINCE OF BIRTH OF RESPONDANT (Percentage distribution)

No. of years lived in Addis Ababa	Province of birth							
	Addis Ababa	Shoa (outside Addis A)	Eritrea	Tigre	Hararge	Wollo	Other	Total
	N=55	N=232	N=151	N=70	N=31	N=24	N=37	N=600
- 2	0	4.7	5.3	1.4	6.5	0	2.7	3.8
2 - 5	0	8.2	27.8	24.3	16.1	12.5	8.1	14.8
6 -	100.0	85.3	66.9	74.3	74.2	87.5	83.8	80.2
Not stated	0	1.7	0	0	3.2	0	5.4	1.2
Total	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0

TABLE A23: DURATION OF RESIDENCE IN ADDIS ABABA BY ETHNIC GROUP OF RESPONDANT

Duration of residence in Addis Ababa in years	Ethnic group					Total
	Tigre N=229	Amhara N=220	Galla N=86	Gurage N=36	Other N=29	N=600
- 2	3.9	2.7	4.7	5.6	6.9	3.8
2 - 6	25.8	7.3	7.0	16.7	6.9	14.8
6 -	70.3	86.8	88.4	77.8	86.2	80.2
Not stated	0	3.2	0	0	0	1.2
Total	100.0	100.0	100.1	100.1	100.0	100.0

TABLE A24: NUMBER OF TIMES MOVED WITHIN ADDIS ABABA BY DURATION OF RESIDENCE IN ADDIS ABABA (Percentage distribution of respondants)

No of times moved within Addis Ababa	Duration of residence in Addis Ababa in years				Total
	- 2 N=23	2 - 6 N=89	6 - N=481	Not stated N=7	N=600
0	56.5	39.3	25.2	0	28.2
1 - 2	26.1	38.2	34.9	14.3	34.8
3 - 4	8.7	11.2	19.1	14.3	17.5
5 -	4.3	4.5	10.8	14.3	9.7
Not stated	4.3	6.7	10.0	57.1	9.8
Total	99.9	99.9	100.0	100.0	100.0

TABLE A25: NUMBER OF TIMES MOVED WITHIN ADDIS ABABA BY ETHNIC GROUP (Percentage distribution of respondants)

No. of times moved within Addis Ababa	Ethnic group					Total
	Tigre N=229	Amhara N=220	Galla N=86	Gurage N=36	Other N=29	N=600
0	27.1	27.7	32.6	27.8	27.6	28.2
1 - 2	34.9	31.4	41.9	36.1	37.9	34.8
3 - 4	19.7	16.4	15.1	13.9	20.7	17.5
5 -	9.6	12.3	3.5	8.3	10.3	9.6
Not stated	8.7	12.3	7.0	13.9	3.4	9.8
Total	100.0	100.1	100.1	100.0	99.9	99.9

TABLE A26: REASONS FOR MOVING within the Kirkos area. Information from 228 respondants at the baseline survey in 1972, who had previously moved within the Kirkos area. Only the main reason is taken into account.

Reason for moving	No. of respondants
Landlord increased house rent	77
To live in a nicer area	34
Relatives offered a house or to live near relatives	14
House "destroyed by Municipality"	13
Built or bought a house	10
To get a larger house	3
To get a cheaper house	2
To be near working place of for better opportunity of earning a living	41
To get better access to transport	4
Because of employment	1
Because of divorce	5
Health reasons	6
Because of bad water supply or bad latrine standard	2
No reason stated	16
Total	228

TABLE A27: NUTRITIONAL STATUS of 418 children under 5 years expressed as weight in % of Harvard Standard

Weight % of HS	Age in months 0 - 5		6 - 11		12 - 23		24 - 35		36 - 47		48 - 59	
	N	%	N	%	N	%	N	%	N	%	N	%
100 -	18	56.3	8	19.5	12	15.6	8	8.9	16	17.0	11	12.9
90 - 99	10	31.3	10	24.4	15	19.7	13	14.4	30	31.9	26	30.6
80 - 89	1	3.1	8	19.5	25	32.9	44	48.9	20	21.3	22	25.9
70 - 79	2	6.3	10	24.4	16	21.1	15	16.7	18	19.1	20	23.5
60 - 69	0		4	9.8	5	6.6	8	8.9	8	8.5	6	7.1
- 59	1	3.1	1	2.4	3	3.9	2	2.2	2	2.1	0	0
Total	32	100.0	41	100.0	76	99.8	90	100.0	94	99.9	85	100.0

TABLE A28: Unique prevalences of different TRADITIONAL PRACTICES and their combinations. In percentages within age group and sex. (C = circumcision or clitoridectomy, U = uvulectomy, T = tooth extraction)

Age	0 - 11		12 - 23		24 - 59		60 -		Total		
Sex	M	F	M	F	M	F	M	F	M	F	M+F
N	47	25	46	38	148	145	250	267	491	475	966
None	15	52	2	1	8	9	3	3	5	7	6
C	21	12	28	0	15	14	21	13	20	12	16
U	11	8	7	18	7	6	2	4	5	6	5
T	4	0	4	5	1	2	0	1	2	2	2
CU	24	12	26	26	24	24	28	28	25	26	26
CT	2	0	0	18	5	3	4	4	4	4	4
UT	2	0	7	8	7	8	5	5	6	6	6
CUT	21	16	26	24	33	34	37	42	33	37	35
Tot	100	100	100	100	100	100	100	100	100	100	100

TABLE A29: STAFF AT THE KIRKOS MCH CLINIC

Permanent staff		1 community nurse 1 dresser 2 cleaners 1 auxiliary	5 1/2 days/week
		2 guards	7 days/week
Visiting staff	Vaccination team	2 dressers 1 clerk 1 driver	1 day/week
	Supervisors	1 physician (child care and administration)	5 hrs/week
		1 physician (maternal care)	3 hrs/week

TABLE A30: WEEKLY PROGRAM AT THE KIRKOS MCH CLINIC

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Morning	Clinic for children Home visits	Clinic for children Home visits	Clinic for children and vaccinations	Clinic for children Antenatal clinic	Clinic for children Home visits	Clinic for children Statistics
After-noon	Nutrition and Health education	Women's club	Clinic for children and vaccinations	Antenatal clinic Family planning	Nutrition and Health education	-

TABLE A31: NUMBER AND TYPES OF VACCINATIONS GIVEN DURING A ONE YEAR PERIOD 1972-1973
(OPV = oral polio vaccine, DPT = diphteria-pertussis-tetanus).

DPT I 2,622	DPT II 1,676	DPT III 1,243	DPT booster 102
OPV I 2.117	OPV II 1,161	OPV III 670	OPV booster 68
BCG 2.229	Smallpox 1,167	Total no. of vaccinations 13,055	

TABLE A32: DISTRIBUTION OF NON-RESPONSE PROPENSITY AND MOBILITY (as reorded at follow-up study in 1973) BY DIFFERENT HOUSEHOLD VARIABLES AMONG 411 HOUSEHOLDS WITH CHILDREN. Non-response classes have been excluded.

Variable	Classes	N	% non-response	% moved
No of hosehold members	2-3	74	58	46
	4-5	141	41	29
	6-7	103	33	19
	8-9	48	35	21
	10-14	45	9	2
No of children below 12	1	125	48	33
	2	110	37	27
	3-4	140	37	24
	5-7	36	8	6
No of children below 5	0	105	38	18
	1	165	39	32
	2	113	36	25
	3-5	28	36	21
Household income Eth. $/month	-49	98	39	29
	50-99	89	47	27
	100-299	127	36	28
	300-	64	27	13
Housing tenure	Owns house	112	23	5
	Rent 0-29 $	184	50	39
	" 30-	86	36	28
	Other arr.	22	18	14
Age of mother in years	- 24	84	44	33
	25 - 29	108	45	35
	30 - 39	122	38	22
	40 -	82	24	12
Religion	Orthodox	348	39	28
	Other	62	34	16
Ethnicity	Tigre	163	38	31
	Amhara	141	35	23
	Other	82	34	23
No. of rooms	1	107	50	40
	2	176	35	25
	3 -	128	32	15
Living area in m^2 per household member	0 - 5.0	176	31	30
	5.0 - 7.5	92	18	17
	7.5 -	68	22	22
Latrine standard	Private	74	24	9
	Shared	282	40	31
	Public	38	34	24
Source of water	Private tap	46	26	11
	Shared tap	233	39	31
	Other	116	35	22
Water consumption in litres per household member and day	0 - 5.0	53	36	25
	5.0 - 7.5	82	32	21
	7.5 - 10.0	52	33	25
	10.0 - 20.0	92	39	28
	20.0 -	60	32	25
Education of mother	Illiterate	305	39	26
	Partially literate	39	33	26
	Formal educ.	56	36	27
Total		411	38	26

TABLE A33: MEAN INCONSISTENCY IN AGE REPORTING IN AGE GROUPS 0-1 AND 1-2 YEARS BY SOME HOUSEHOLD VARIABLES. No information classes have been excluded.

VARIABLE	CLASS	AGE GROUP 0-1 N	0-1 mean	1-2 N	1-2 mean
MOTHER RESPONDANT ON BOTH OCCASIONS	Yes	37	0.8	29	1.6
	No	9	1.0	21	1.7
HOUSEHOLD INCOME (ETH $/month)	- 49	10	1.0	4	3.5
	50- 99	9	0.6	8	2.0
	100-299	16	0.8	21	1.6
	300-	8	0.9	13	1.2
EDUCATION OF FEMALE GUARDIAN	Illiterate	29	0.8	35	1.8
	Literate	15	0.9	15	1.2
AGE OF FEMALE GUARDIAN (years)	-24	14	0.6	15	1.9
	25-29	15	1.1	14	1.1
	30-39	16	0.9	16	2.1
	40-	0	-	3	1.0
ETHNIC GROUP	Tigre	22	0.6	23	1.7
	Amhara	13	1.0	15	1.7
	Oromo	8	1.1	5	1.4
	Gurage	1	1.0	3	1.3
	Other	2	1.5	3	1.0
RELIGION OF HEAD OF HOUSEHOLD	Orthodox	37	0.9	44	1.7
	Muslim	3	1.3	4	1.0
	Other	6	0.5	2	2.1

TABLE A34: DEGREE OF INCONSISTENCY IN AGE REPORTING IN AGE GROUP 2-5 YEARS.
Percentage distribution by some household variables.
No information classes have been excluded

VARIABLE	CLASS	N	Inconsistency (years) -1/2	1/2-1	1-1 1/2	1 1/2-	Total
MOTHER RESPONDANT ON BOTH OCCASIONS	Yes	129	66.7	24.0	8.5	0.8	100.0
	No	62	62.9	22.6	12.9	1.6	100.0
HOUSEHOLD INCOME (ETH $/month)	- 49	35	57.1	31.4	11.4	0.0	99.9
	50- 99	30	73.3	20.0	3.3	3.3	99.9
	100-299	67	58.2	26.9	13.4	1.5	100.0
	300-	42	71.4	21.4	7.1	0.0	99.9
EDUCATION OF FEMALE GUARDIAN	Illiterate	135	63.0	22.2	13.3	1.5	100.0
	Literate	53	71.7	26.4	1.9	0.0	100.0
AGE OF FEMALE GUARDIAN (years)	-24	37	59.5	32.4	8.1	0.0	100.0
	25-29	56	80.4	16.1	3.6	0.0	100.1
	30-39	65	64.6	30.8	4.6	0.0	100.0
	40-	30	50.0	10.0	33.3	6.7	100.0
ETHNIC GROUP	Tigre	87	73.6	19.5	6.9	0.0	100.0
	Amhara	63	58.7	25.4	14.3	1.6	100.0
	Oromo	21	76.2	19.0	4.8	0.0	100.0
	Other	13	53.8	23.1	15.4	7.7	100.0
RELIGION OF HEAD OF HOUSEHOLD	Orthodox	163	65.6	24.5	8.6	1.2	99.9
	Muslim	15	46.7	26.7	26.7	0.0	100.1
	Other	14	85.7	7.1	7.1	0.0	99.9

TABLE A35: DEGREE OF INCONSISTENCY IN AGE REPORTING IN AGE GROUP 5-12 YEARS.
Percentage distribution by some household variables.
No information classes have been excluded.

			Inconsistency (years)				
VARIABLE	CLASS	N	-1/2	1/2-1	1 - 1 1/2	1 1/2-	Total
MOTHER RESPONDANT ON BOTH OCCASIONS	Yes	228	52.6	17.1	21.9	8.3	99.9
	No	128	46.1	22.7	24.2	7.0	100.0
HOUSEHOLD INCOME (Eth. $/month)	-49	62	46.8	14.5	29.0	9.7	100.0
	50-99	69	50.7	20.3	17.4	11.6	100.0
	100-299	119	42.0	23.5	26.1	8.4	100.0
	300-	77	55.8	20.8	19.5	3.9	100.0
EDUCATION OF FEMALE GUARDIAN	Illiterate	259	50.6	17.8	22.4	9.3	100.1
	Literate	88	46.6	22.7	27.3	3.4	100.0
AGE OF FEMALE GUARDIAN (years)	-24	30	36.7	36.7	20.0	6.7	100.1
	25-29	72	56.9	20.8	22.2	0.0	99.9
	30-39	155	54.2	18.7	20.0	7.1	100.0
	40-	86	43.0	11.6	29.1	16.3	100.0
ETHNIC GROUP	Tigre	139	61.9	16.5	18.0	3.6	100.0
	Amhara	137	39.4	19.0	29.9	11.7	100.0
	Oromo	53	58.5	18.9	13.2	9.4	100.0
	Other	28	25.0	35.7	32.3	7.1	100.1
RELIGION OF HEAD OF HOUSEHOLD	Orthodox	288	50.7	20.5	21.2	7.6	100.0
	Muslim	33	36.4	21.2	36.4	6.1	100.1
	Other	40	57.5	10.0	22.5	10.0	100.0

TABLE A36: EXAMPLES OF BIVARIATE ASSOCIATIONS BETWEEN MEASURES OF CHILD HEALTH (weight for age in % of H.S. and morbidity in % - for definitions see chapter 5). AND INDIVIDUAL AND HOUSEHOLD CHARACTERISTICS in a group of 268 children with information on baseline weight in 1972 and morbidity 1972-73. Non-response classes have been excluded.

Variable	Class	N	Percentage distribution Weight group <80	80-	Morbidity group <10	10-20	20-	Mean weight in % of HS	Mean morbidity in %
Age in months	0- 5	22	9	91	9	23	68	104.5	26.5
	6-11	25	44	56	24	24	52	84.3	25.2
	12-17	29	31	69	10	28	62	84.9	23.7
	18-23	20	30	70	15	20	65	83.8	25.5
	24-35	53	26	74	28	40	32	85.2	17.6
	36-47	64	28	72	45	27	28	88.3	14.8
	48-59	55	29	71	49	29	22	86.9	12.1
Sex	Male	129	24	76	33	27	40	89.7	18.5
	Female	139	32	68	30	30	40	85.8	18.4
Age of mother in years	-24	62	26	74	27	23	50	87.5	22.4
	25-29	91	26	74	31	29	40	87.5	19.4
	30-39	83	28	72	34	31	35	89.8	15.7
	40-	28	39	61	36	39	25	82.9	14.8
Education of mother	Illiterate	198	33	67	31	28	40	86.4	18.5
	Literate	67	15	85	33	30	37	91.0	18.5
Household income in Eth. $ per month	- 49	45	40	60	33	29	38	86.3	18.0
	50- 99	50	32	68	24	34	42	88.2	21.8
	100-299	94	28	72	27	22	51	86.8	20.5
	300-	55	13	87	38	38	24	89.5	14.7
No. of rooms	1	59	41	59	20	32	48	83.2	22.5
	2	128	26	74	27	24	48	89.3	20.4
	3-	72	22	78	40	38	22	88.8	13.3
Living area in m^2/household member	-2.5	28	39	61	29	21	50	83.8	20.6
	2.5-5.0	120	31	69	26	33	41	87.8	19.8
	5.0-7.5	62	24	76	42	19	39	89.7	17.6
	7.5-	40	18	82	35	35	30	88.6	14.7
Latrine standard	Water flush	21	14	86	67	24	9	91.7	9.7
	Private pit latrine	41	27	73	46	27	27	88.9	13.7
	Shared pit latrine	183	31	69	23	31	46	87.4	20.9
	Public pit latrine	19	26	74	32	26	42	83.4	18.0
Water consumption in litres per household member and day	- 5	34	35	65	23	32	44	84.3	19.2
	5-10	93	30	70	29	27	44	87.5	20.9
	10-20	62	26	74	26	31	44	85.9	19.9
	20-	39	28	72	44	26	30	92.1	13.9

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